COMPLETE NEWS REPORT OF THE 1961 API CONVENTION

the OIL AND GAS JOURNAL

PUBLISHED WEEKLY NOVEMBER 20, 1961

What the meeting was all about. p. 117

Porter: Big problems are homemade. p. 119

Kelly: Don't come to government for help. p. 119

Monroney: Let's team up against Russia. p. 123

Brockett: New head of transportation. p. 128

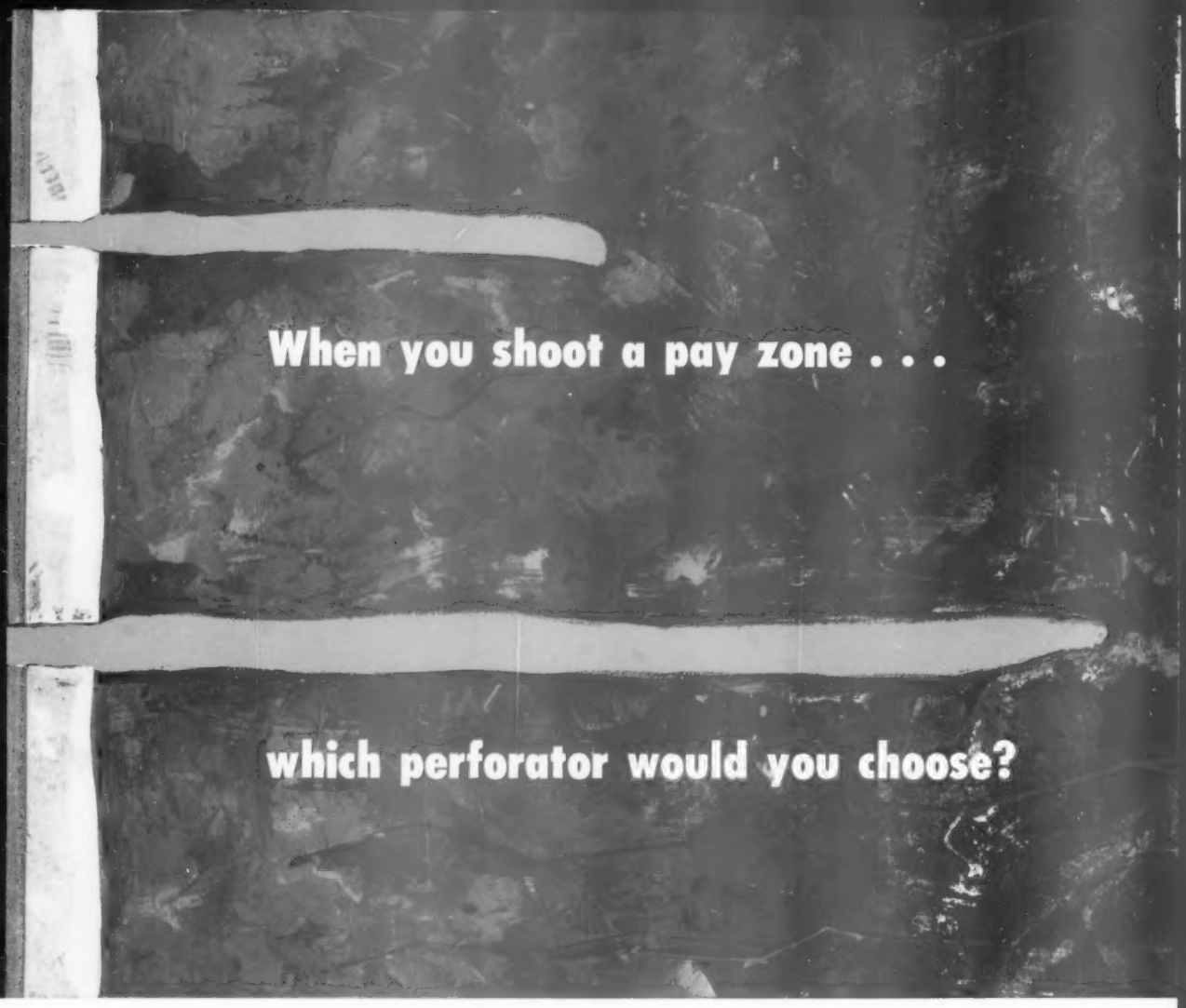
Plus

Persian Gulf strike classed as 15,000-25,000-bbl. well. p. 137

Photogeology - a quick, economical tool for oil hunters. p. 265

New API chairman, Leonard F. McCollum, insists . . .

"It's time for economic—rather than operating—decisions"



Is a perforator that just puts a hole in the pipe good enough? Not if formation damage around the bore hole is considered. Damage due to invasion of mud solids, while unpredictable, is known to extend eight, ten or more inches from the well bore. The top perforation shown above was made by a perforator which is in field use. It will perforate the casing and cement, but may not have enough penetration to reach beyond the damaged zone.

The NCF II produces a perforation greater in depth and Well Flow Index than any other retrievable shaped charge gun. Its relative performance is shown in the lower illustration. The performance of both perforators depicted above is based on actual tests.

Unquestionably, the charge offering the best possibility of reaching the undamaged formation is the best choice, and that is the NCF II.

This charge has been even further improved since its introduction in June, 1961. Here are the results of the latest performance tests in standard Berea targets certified by the Perforation Investigation Committee.

	3⅛" NCF II	4" NCF II
Hole size (casing)	.3*	.5*
Probe depth	9⅝"*	11⅛"*
Total depth	9¾"*	11¾"*
Burr height	.064*	.155*
Well Flow Index	1.5	2.0

**The Koneshot NCF II Perforator has been tested in accordance with the Perforation Investigation Committee standard test procedure which provides standard targets and procedures for comparing performance of all guns tested. The Perforation Investigation Committee makes no endorsement of the perforating equipment tested and makes no interpretation of the standard test data obtained.*

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THE KONESHOT NCF II OUTPERFORMS EVERY OTHER RETRIEVABLE SHAPED CHARGE PERFORATOR

OIL AND GAS JOURNAL
Vol. 59, No. 47

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Technology

Refining-Processing

How to have a smooth, safe plant startup 155

By J. A. Richardson

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Processing notes 158

Polypropylene pipe wins supporters—Polypropylene plant goes on stream—Petroleum products required for asphalt paving.

Pneumatic analog computing for your plant 165

By C. L. Mamzic

Pneumatic components of proved high reliability and low cost are now available to perform all the basic analog computing operations. Two new computing components—linearized pneumatic relays for differentiation and integration—and a new pneumatic optimalizing controller give added versatility to the field of analog computing.

The case for air-cooled exchangers—2 176

By J. R. Christman

Air coolers can perform the desired cooling duties during the warmest weather. Early control problems have largely been overcome. Concluding installment in two-part series.

Production

There's profit in those stock-tank vapors 160

By T. R. Blevins and F. G. Van Matre

Strategic location of gasoline plants in the Denver basin have provided a market for large volumes of rich stock-tank vapors. By installing small skid-mounted compressors to gather, compress, and inject these rich vapors into the gathering system, Continental Oil Co., operator of Little Beaver gas plant, has been able to practice conservation as well as to substantially increase revenue to both gasoline plant and producer.

Drilling

New mud for high-temperature wells 186

By Fred Chisholm, Robert W. Ruhe, Jr., and William J. Murchison

Simplicity and versatility are the virtues claimed for this new chrome lignite-chrome lignosulfonate mud. It resists high temperature and high pressure, stabilizes downhole formations, and controls fluid loss. Result usually is less hole trouble, faster drilling. More than 300 field tests testify to the new mud's effectiveness. The authors give 12 good rules for field control of any mud system.

Pipelining

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Huge meter prover goes to Libya—Swing speeds pig transfer—Revenues increase faster than sales—Solid-state system to control pipeline—FPC approves 1,561 miles of pipe.

THE OIL AND GAS JOURNAL **Newsletter**

November 20, 1961

Significant this week

Oil men are getting a firmer idea of how changing economic conditions affect the industry, and there's hope that this understanding may lead to solution of current troubles.

That means the industry is starting to face up to reality, and—in a nutshell—this conclusion reflects the spirit of the forty-first API meeting held last week in Chicago.

Some of the beliefs expressed in talks before the big convention: oil won't pull out of its slump just because there's a general improvement in business conditions; aggressive and capable industry leadership is a must.

Marketing problems overshadowed any other single topic at the meeting. Most delegates agreed the irrational pricing and reckless competitive actions in this segment of the industry can only be controlled through responsible policy making.

Speakers also covered a wide range of other industry issues, including demand, natural-gas regulation, production, and public-relations tactics.

The Journal's sweeping report on the API begins on p. 117.

Disclosure of plan for Humble to take over Olin Oil & Gas points up Humble's interest in natural gas and pipelines.

Acquisition of Olin would give Humble a 1,284-mile gas-pipeline system in Louisiana and Mississippi. Olin has about 3,300 bbl. daily of oil production, but its assets are tied up mainly in a gas-transmission subsidiary which is the "heavyweight" attraction of the $68-million deal (p. 139).

Topnotch gas discovery is shaping up in California's San Joaquin Valley. Occidental Petroleum well in northern tip of valley flowed 22 million cubic feet daily in tests (p. 146).

In another California development, Long Beach city council is pondering a plan to let oil operators have a crack at 6,500 acres in tidelands area of rich Wilmington field (p. 140).

Texas crude allowable for December will be 9 days. Action snaps streak of 8-day allowables that lasted for 8 weary months (p. 146).

Engines with compression ratios of 12:1 or higher aren't likely to make hit with motorist until cheaper fuels and lubes for high-compression engines are developed.

This key point was made at recent SAE fuels meet (p. 150).

Campaign for higher rates on rig moving has been extended to Texas and Louisiana.

In battle over increased interstate charges in Rocky Mountain area, Oil Field Haulers Association has already won first round. Drilling contractors and shippers are appealing case.

AAODC is in forefront of those fighting against higher intrastate charges in Louisiana and Texas (p. 151).

Tempo of drilling in northeastern British Columbia may set record this winter. One forecast calls for more than 150 development wells and 60 wildcats, against combined total of 143 last year (p. 144).

Speaking of records, several new drilling marks were set in Oklahoma last week. One was in Roger Mills County, where a Gulf wildcat found deepest Pennsylvanian production anywhere. Well flowed 2,350 M.c.f. daily from below 17,000 ft. (p. 139).

Canada wants its local manufacturers to get more of $50-million-a-year drilling-equipment market. Most equipment now comes from U. S.

Government's putting its weight behind campaign to stir up manufacturer interest in production of such gear (p. 141).

New Pan Am strike in Iranian waters of Persian Gulf may be good for 10,000 to 20,000 bbl. daily on commercial production.

Actual potential of find—called Darius 1—couldn't be tacked down immediately. Separator facilities were able to handle only 11,000 bbl. daily when first tests were made.

Company plans to launch commercial operation of field by latter part of 1962. And Pan Am intends to drill as many wells as possible on 1-mile spacing in the meantime (p. 137).

French strike in Northwest Libya gives bright touch to exploration outlook in that area.

CPTL's wildcat discovery flowed 1,187 bbl. daily on tests. And it's only 75 miles from Mediterranean. Plenty of other discoveries have been chalked up in western Libya, but distance from coast was adverse factor for many of them (p. 152).

News in the making

Still wondering how Normanna gas case will affect oil fields with similar small-tract problems?

Answer may come soon. At a December 4 hearing in Austin, Texas Railroad Commission will take evidence on which it will base decision whether to change allocation formulas in several reservoirs. These are in big Southeast Quitman field of Wood County, East Texas.

Shell and Sun requested hearing.

Checking on operations of unattended pipeline stations may be easier in future.

Recently developed device permits station to be dialed from any telephone. If all's well, certain signal is given; if something's wrong, another kind of signal is transmitted. Connecticut power company is using device in seven stations.

Canadian crude will reach Buffalo through an extension of Interprovincial pipeline by next spring.

It's understood Canada's National Energy Board has okayed 90-mile, 12-in. line from Hamilton, Ont., to Ashland's Buffalo plant. Latter now takes 10,000 bbl. daily of Alberta crude by tanker. Mobil's Buffalo refinery is expected to become customer later.

Watch outcome of Katy Railroad's tests of switch engine fueled by propane.

If tests with converted diesel locomotive are successful, Katy will use propane on wide scale for locomotives in regular service.

Big savings are expected from new customs ruling which permits free entry into U. S. of magnetic tapes containing seismic data.

Decision reverses former practice of slapping heavy taxes on tapes returned to U. S. from foreign operation areas.

Keep an eye on leaded propane as a possible primary fuel in dual-fuel engines.

Tests have shown that leaded propane can produce as high a power output and thermal efficiency as diesel fuel. Development could broaden market for propane.

Watch for appearance of "Isomax" hydrocracking process.

Universal Oil Products and California Research Corp. have agreed to cross-license and to share know-how on their 2-year-old hydrocracking processes, and will dub the resulting process Isomax. It's combination of Cal Research's Isocracking and UOP's Lomax.

Crude-distillation units are getting more attention from refiners nowadays. And it's paying off.

For a long time the industry was preoccupied with downstream processing. But many refiners are now replacing old crude-distillation units or revamping existing ones.

The results: sharper cuts better tailored to downstream requirements, lower operating and maintenance costs.

Two recent developments in gas chromatography have been tied together, and the combination promises a big advance in process analyses and control.

New printing electronic integrator has been coupled with detector of a high-speed gas chromatograph which analyzes multicomponent streams in seconds. Advantages: greater accuracy, more frequent analysis of critical streams.

Market memo

Nov. 20, 1961

Impressions brought back from API marketing sessions in Chicago:

. . . **Jobbers and dealers** are very bitter at some of the recent pricing moves by major suppliers. So are some of the other majors.

. . . **Solution** of the industry's problem must include everyone. **Producers** may have to cut back even more sharply. **Refiners** must gear runs to contract sales requirements. **Marketers** must determine to sell for a profit, curb their mania for growth in a static market.

. . . Consensus of nearly everyone is that continued **chaos will invite governmental control.** There's a growing group that wants to take its troubles to the government now.

Surprising number of executives, however, say privately they are optimistic that prices will improve soon and stability will return to the markets.

A look at the spot markets:

On the Gulf Coast, gasoline is getting into better shape with 90-octane material firm at 10.75-11.00 cents on talk of a cargo movement to the West Coast and buying by a big major. No. 2 also is firm at 8.50 but needs improvement in New York Harbor prices to spur demand.

On the East Coast, a general seasonal price increase in distillates was pending last week. Summer discounts of one-half cent a gallon are expected to be removed.

In the Mid-Continent, the outlook continues to brighten. Gasoline is firm at 10.50 cents for unbranded. Distillates have edged up one-fourth of a cent to 8.50-8.75 cents per gallon and probably will advance another one-fourth if really cold weather should hit.

Dealer turnover the first 6 months shows little change.

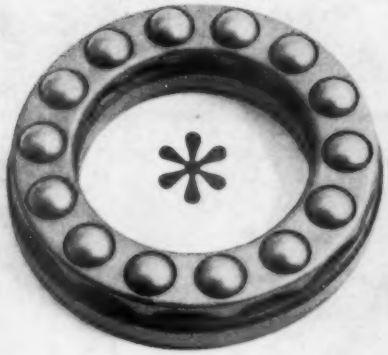
At supplier-controlled stations, the dealer turnover was 3.9% for reasons beyond the company's control and 9.7% for terminations occurring for other reasons. Figures were 3.6% and 10.2% last year.

Tidewater is offering travel insurance to its West Coast credit-card holders.

Insurance applications are mailed to customers, eliminating the need for dealers to handle the insurance. The policy has $10,000 coverage for death and $1,000 for medical costs.

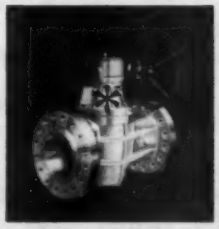
Look for **Gulftane** to be in all Gulf Oil Corp. market territories in the Rockies and eastward before the year is out. Company is pushing rapidly to substitute new three-grade system that pits sub-regular grade against private brands and eliminates superpremium.

Expansions: Delhi-Taylor has acquired three Florida service-station chains totaling 49 outlets . . . **Tenneco Oil** reportedly is negotiating with two New Jersey fuel-oil jobbers and **Phillips** plans entry soon into Connecticut . . . **Ashland** has its first products terminal on the East Coast located on 8-acre site in Baltimore Harbor. Terminal has a deep-water dock plus rail and trucking facilities. It formerly was occupied by Cities Service, but Ashland has added substantial tankage while remodeling the property . . . **Pennzoil** is shipping lube oil through new Delaware River terminal near Philadelphia to West Coast, cutting down multiple handling required when it shipped through New Orleans . . . **Ohio Oil** has opened new 170,000-bbl. products terminal near Niles, Mich.



*This is the secret of Rolotork®

The single-unit plug-and-stem of Walworth's Rolotork Lubricated Plug Valve is mounted like the drive shaft of a fine machine tool. Super-hardened ball bearings absorb thrust—as high as 100,000 pounds—yet let the valve operate without an ounce increase in torque! That's



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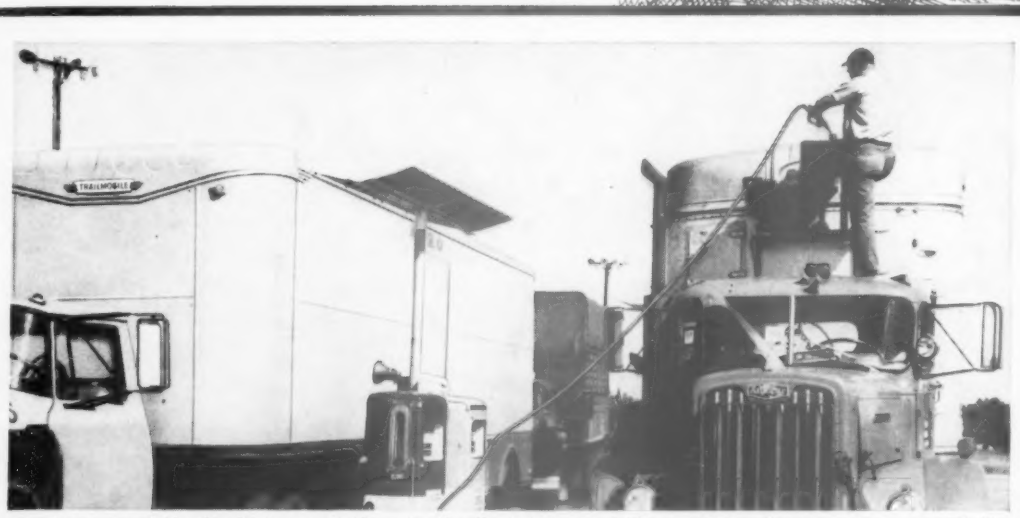
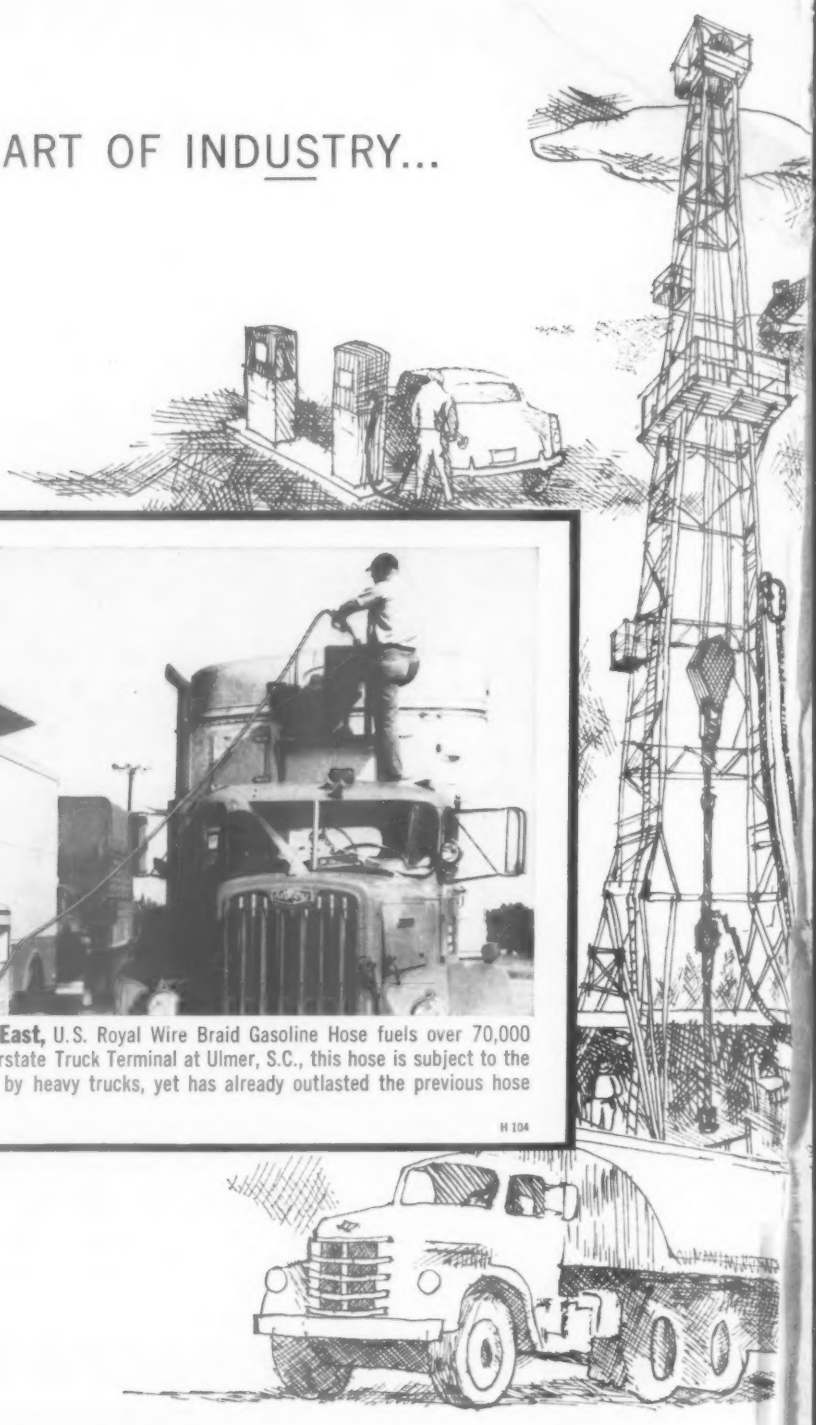
AT THE HEART OF INDUSTRY...

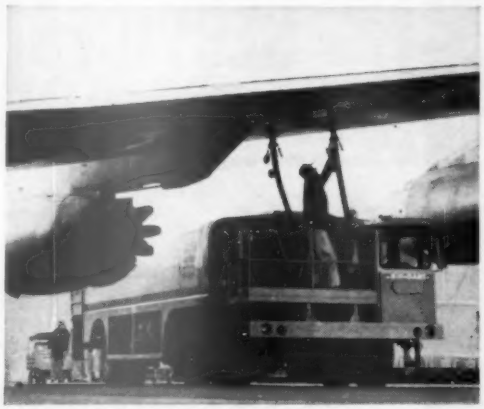


Serving one of the busiest gas stations in the East, U.S. Royal Wire Braid Gasoline Hose fuels over 70,000 vehicles a year. Installed on all 12 pumps of the Interstate Truck Terminal at Ulmer, S.C., this hose is subject to the severest 24-hour-a-day service, is run over repeatedly by heavy trucks, yet has already outlasted the previous hose by more than 5 to 1!

H 104

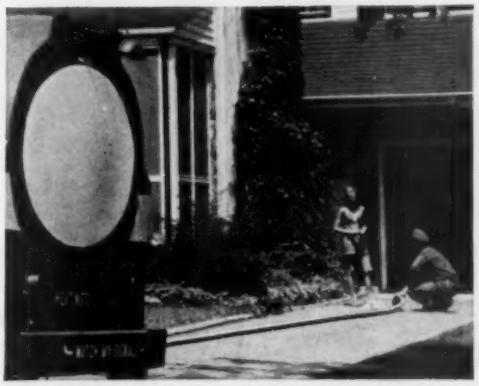


In oil marketing, as in all industry, you'll see US Hose serving in the most demanding applications, performing faithfully long after other hose have failed. Such consistently high performance records have helped make US the world's largest hose manufacturer.



Feeding the hungry tanks of commercial and private planes at leading airports everywhere, tough U.S. Royal Aircraft Fueling Hose resists the sharp attack of the new highly aromatic aviation gasolines and jet fuels, won't kink or collapse, withstands the most severe weather and hard, abrasive use. Yet it is light and easy to handle even atop the highest wing.

H 105

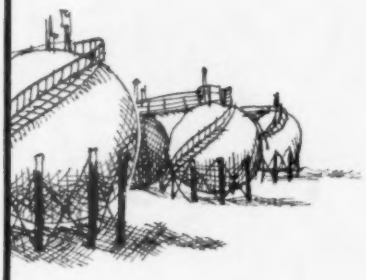


Delivery trucks by the thousands, serving homes by the millions, rely on the proven toughness, flexibility, and long working life of U.S. Royal Fuel Oil Delivery Hose. Unusual lightness and ease of handling, coupled with high kink resistance, contribute to an overall efficiency of delivery operations that drivers and management both appreciate. You'll find this same "serviceability" in all US hose.

H 107

The wayward wheels of a careless driver have more than once run over, and even parked on, a U.S. Royal Tank Wagon P-5176 Hose. Yet, thanks to its "soft" construction and the inherent toughness of all US oil marketing hose, the P-5176 bounces back unharmed. Its super-flexibility allows easy handling in close quarters, too, yet this hose drapes from the back or side of a truck without kinking.

H 106



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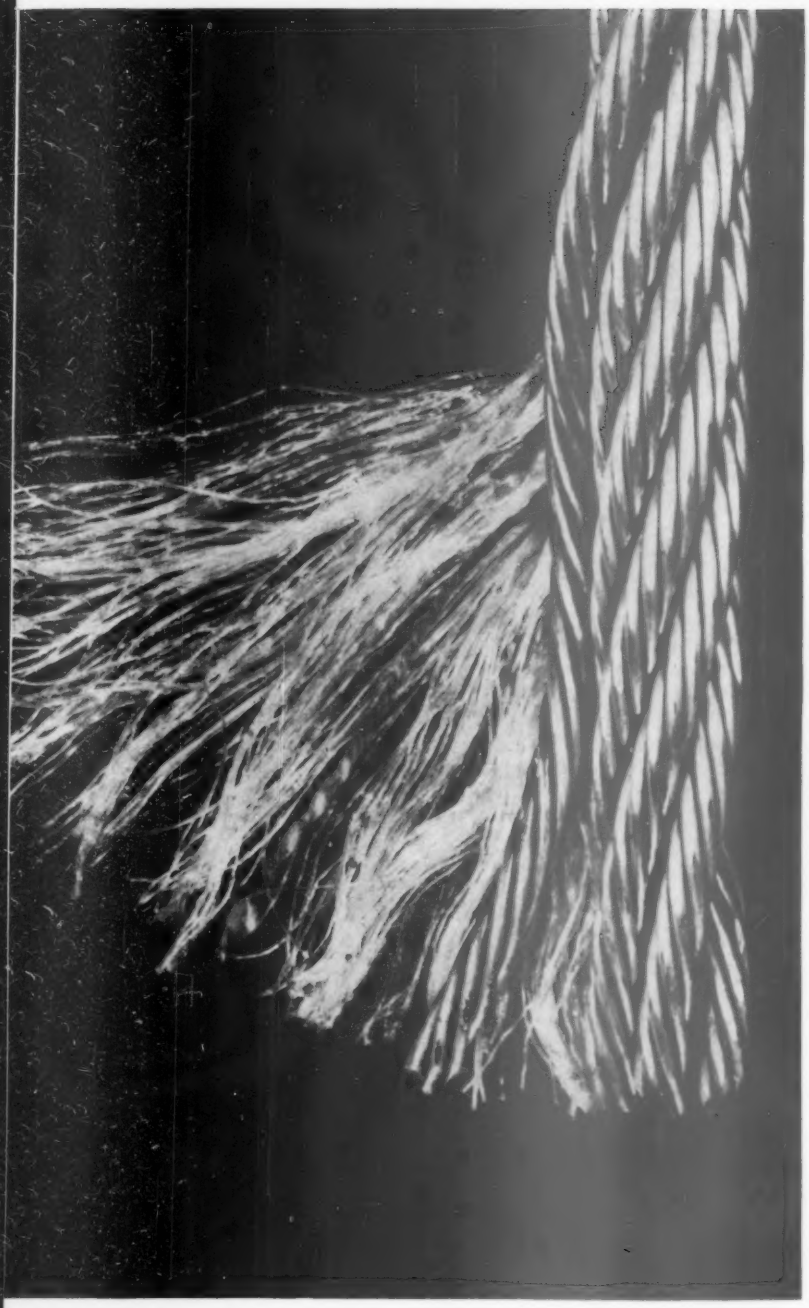

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The search has ended for a wire line core that eliminates washout and early failure. PETROFIBER is the answer. Developed and proven by U. S. Steel's American Steel and Wire Division, PETROFIBER is used in USS Tiger Brand Wire Lines for drilling, swabbing, coring, etc. and delivers these remarkable advantages:

100% resistant to all hole fluids. PETROFIBER is completely impervious to acids, caustics and other corrosive agents such as sour crude, salt water and hydrogen sulphide gas. No more core washout or erosion.

A more stable line. PETROFIBER cores stop core flow and migration. They give such excellent strand support, and maintain uniform line diameter under all conditions, that they bear no resemblance to any solid plastic core line you've ever used.

Withstands temperatures from −80°F to 300°F. PETROFIBER cores withstand continuous operation at higher well temperatures than ever before. Lower possibility of flattening or core squash-out at overheated drum flanges. And because they're even tough at *minus* 80°F, you can use them to equip rigs in the Arctic.

Ends storage problem. PETROFIBER cores don't absorb hole fluids or chemicals, so you can store without rot or progressive aging.

USS Tiger Brand Wire Lines with PETROFIBER Cores are made in standard constructions, 6 x 7 and 6 x 19, in all regular sizes. Buy it through your "Oilwell" store.

Service with a smile

Who wouldn't smile under these conditions? In the picture, AS&W Service Representative Bill Campbell is checking the condition of a USS Tiger Brand Wire Line with PETROFIBER Core after a year of work swabbing deep wells. Its biggest job was a 17,300-foot well in Pecos County, Texas, where it swabbed continuously for four weeks. During that time it handled 121,000 gallons of 15% hydrochloric acid, preheated to 180°F, pumped into the well and swabbed back immediately (bottom hole temp. was 280°F), and 145,000 gallons of gelled water and frac sand. Just about the most corrosive conditions a swabbing line would ever have to handle. The payoff: the PETROFIBER core showed no sign of acid attack or deterioration of its strand supporting ability. So Bill Campbell didn't have a problem, but he is one of 25 American Steel and Wire Service Reps who are on hand to help you with any wire rope problems you have. When you buy Tiger Brand Wire Rope through "Oilwell", you can be sure our product is backed with the best service you can find.

Free advice

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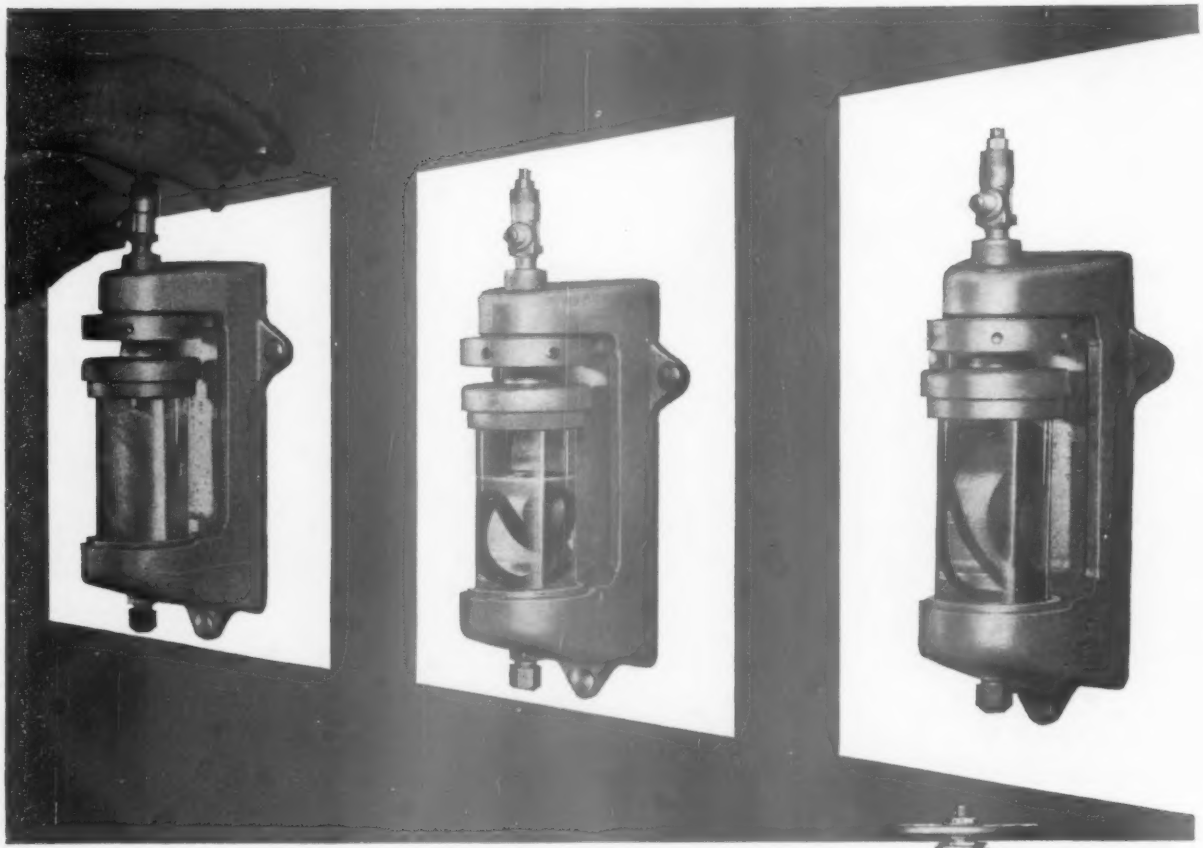


Kerotest Valve Parts Get the ALL CLEAR FROM BOMBS

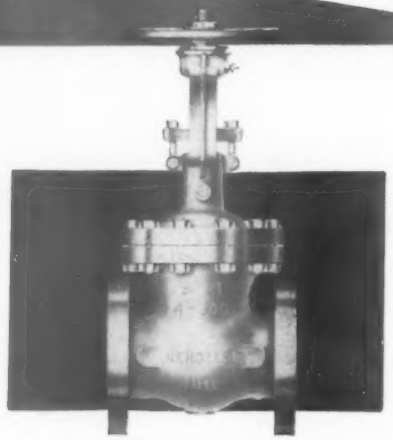
All materials and parts that go into Kerotest Valves must first get the all clear in these pressurized material test bombs at the Kerotest laboratories. Packings, plastics, gaskets, O-rings, seat rings, steel, and other materials are accepted as suitable only after they've withstood the deteriorating effects of various gases, vapors, liquids and refrigerants for specified test periods.

Kerotest quality controls are applied from the initial development and engineering phase to the final assembled valve. For those who specify and use Kerotest Valves these high standards of material and production quality mean greater valve value per dollar. With Kerotest there's minimum risk of valve failure in service and improved operating efficiency with less maintenance.

Kerotest Cast Steel Gate Valves

High quality Kerotest cast steel gate valves are available in primary service pressure ratings ranging from Series 150 to Series 1500. They are supplied in various combinations of body and trim material for all types of service in oil, gas, steam, water, chemical, petro-chemical, marine and industrial installations.

Send for your free copy of the new, informative Kerotest booklet. It's packed with working tables, dimensions, specifications and other helpful information.



KEROTEST
Quality Controlled Features

- Reinforced wall sections guard against unusual strains — erosion and corrosion.
- Built for repacking under pressure in the full open position.
- Deep stuffing box for greater packing life and tighter seal.
- Threaded, bottom seating type seat rings. Made without protruding lugs to permit full clear way opening through valves.
- All yokes made to withstand rough handling and equipped with lubrication fitting to stem nut.

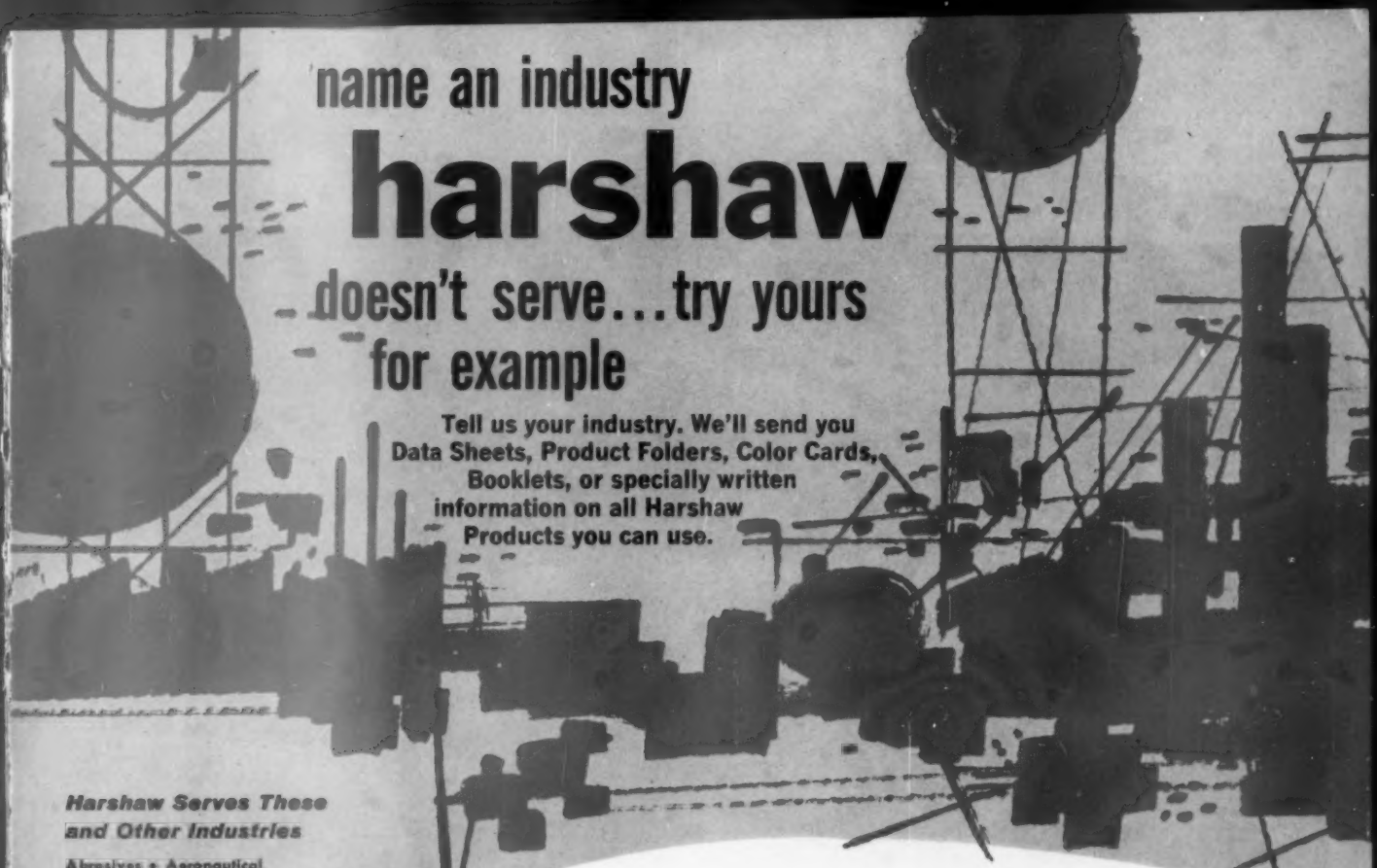
There is a Kerotest Cast Steel Valve available for every class and condition of service.

KEROTEST MANUFACTURING COMPANY

2582 LIBERTY AVENUE • PITTSBURGH 22, PA.

In Canada... Kerotest Cast Steel Valves are manufactured and distributed exclusively by Guelph Engineering Company, Guelph, Ontario, Canada

KEROTEST®



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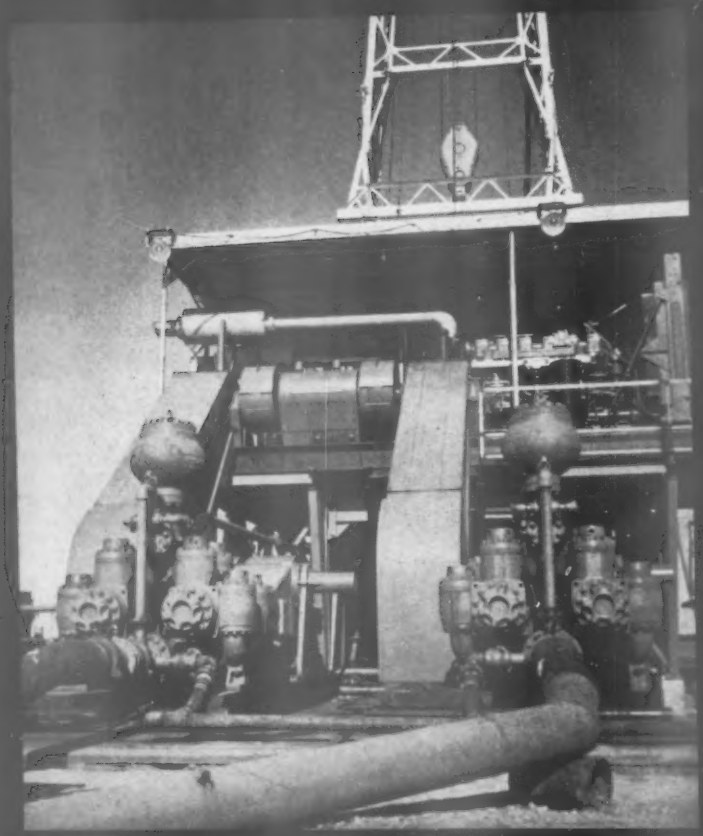

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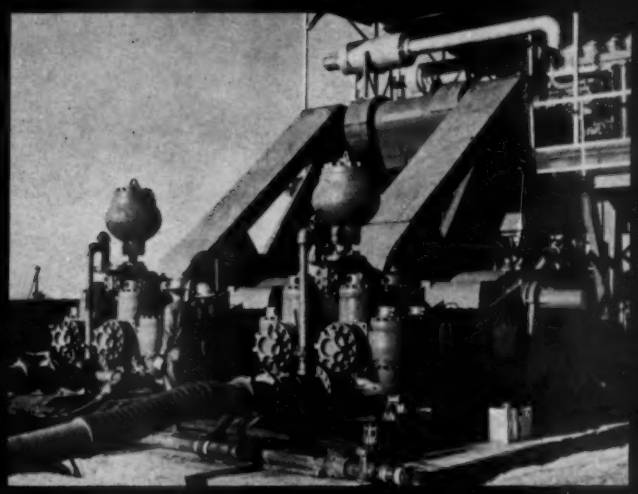

. . . Gardner-Denver pumps
Gardner-Denver parts
Gardner-Denver service

Drilling crews often find their nearest neighbors to be jack rabbits, coyotes and sidewinders. At night their rig lights may be the only sign of human activity for fifty miles.

Dependable equipment is essential. So more and more drilling contractors have standardized on Gardner-Denver mud pumps.

When service is required, the Gardner-Denver pump can generally be repaired in the field with parts quickly available from a local J&L Supply store.

And it's wise to insist on genuine Gardner-Denver parts to put a pump in like-new condition.

Complete information on any Gardner-Denver pump is available from your local J&L Supply man, or from our Tulsa office, 1437 South Sheridan Road, Tulsa.

Jones & Laughlin Supply Division « Tulsa

Protection of producing zones is vital in any well regardless of depth or complexity. A simple, shallow well receives the same earnest attention as the deeper, more difficult ones when Halliburton cements them.

At your Halliburton Service Center, the same rugged equipment, the same high quality materials, the same skill and experience stand ready to cement your job whether it calls for one small cementing truck or a dozen massive Twin HT-400 Cementing Units.

These Halliburton Materials and Equipment Help Provide Dependable Cementing . . . Regardless of Job Size

A clean well bore is a prerequisite to good cement bonding. Halliburton developed Mud-Flush to do this job. It has proven itself to be unequaled for this purpose. Mud-Flush helps clean fluid and partially dehydrated mud from wells, with little or no disturbance of the filter cake. This is particularly desirable wherever lost circulation is a problem.

The cleaning action comes from a mud thinner and Morflo II, a Halliburton-developed surfactant, working together to thin and disperse fluid and partially dehydrated mud in the hole.

After cementing, Mud-Flush can be pumped far back into fractured or perforated formations — even highly acid-soluble ones — to disperse clogging mud particles and permit more flow capacity.

The treatment penetrates deeply into most types of permeable formations regardless of acid solubility.

Halliburton Tailors Cement Blends to Your Well Requirements . . .

Lost circulation zones call for lighter weight slurries with bridging agents added to obtain the best fill-up in the annulus for greater strength. Pozmix Cement with Gilsonite is half pozzolanic materials, and half portland cement with Gilsonite added to produce a low-density slurry. Adding volume, not weight, Gilsonite's graded particle size offers superior bridging characteristics for better control of lost circulation. Fill-up of 90% has resulted in many instances with slurry weights ranging from 15.6 lb. per gallon to as low as 10 lb. per gallon. This type cement is resistant to attack from sulphate waters.

FULL-FLOW PACKER SHOE

ROTO WALL CLEANER

CEMENT BASKET

S-3 CASING CENTRALIZER

Big or Small, Your Job Calls for Dependable Tools

Downhole tools play an important role in dependable cementing. Halliburton designs and manufactures these tools to provide better performance. The Formation Packer Shoe, for instance, packs off open hole below the casing for the purpose of helping to protect low pressure formations from cement contamination. Also, it guides and floats the casing string in and allows circulation through the end of the shoe. After the packer is set, cement flows through ports in the side of the shoe, and the Super Seal Back Pressure Valve helps keep the slurry from backing up inside the casing above the tool.

Other Halliburton Tools Aid In The Success of the Cementing Job

Roto Wall Cleaners are used to help remove mud from the bore hole wall to permit a better cement bond and to minimize precautionary or remedial squeeze jobs. Claw-like spring steel fingers dig into the filter cake when the casing is rotated. Since the casing is already in place when rotation begins, there's much less likelihood of sticking the casing out of place.

S-3 Casing Centralizers provide maximum centering force to allow the cement to completely surround the casing for a better bond, and help prevent channeling.

Every cementing job deserves top quality materials, efficient equipment, and experienced cementers. You can rely on Halliburton for all three.

CEMENTING SERVICES

Halliburton
COMPANY · DUNCAN, OKLAHOMA

275 Service Centers
. . . just minutes away
from your well!

JUST LIKE MONEY IN THE BANK

Save as you store volatile liquids in General American conservation structures

General American fabricates tanks with every type of floating roof, tanks with lifter roofs, dry-seal gasholders and vapor balancers that will pay for themselves with the product they save.

Two outstanding seals—the Wiggins Safety Seal, safest, surest seal you can buy, and EverSeal, a solid cushion seal especially made for "problem" liquids — are offered with the floating roofs.

Skilled field crews of General American and subsidiaries are available to erect these structures where you require them.

Write for General American Bulletin No. PW-1059 for descriptive details.

General American Floating Roofs
Hidek
Lodek
Double Deck
Annular Pontoon
Pan

General American Floating Roof Seals
Wiggins Safety Seal
EverSeal

Other conservation structures
Lifter Roof Tanks
Dry Seal Gasholder
Vapor Balancer
Atmospheric Pressure-Refrigerated Storage Tank

Plate and Welding Division
GENERAL AMERICAN TRANSPORATION CORPORATION
135 South LaSalle Street
Chicago 3, Illinois
Offices in principal cities

need help on foaming problems?

If you operate a gas treating unit using ethanolamines or ethylene glycols, chances are foam is nothing new to you. It's not necessarily a sign of trouble. But if foam is too stable, you may soon be up to your ears in foaming problems.

What to do: Proper care of the amine or glycol solution is the best cure for foaming problems. Start with materials of guaranteed purity, ethanolamines and ethylene glycol from Allied Chemical.

- In amine systems, first preventive steps are proper reclaimer operation and adequate filtration – using activated charcoal, in some cases, to adsorb foam-generating materials.
- In glycol systems, first steps are proper pH control, adequate filtration and provision for good separation of hydrocarbons and glycols.

How to rate your unit on foam: Bubble air through a 50-ml. sample of plant solution in a graduated cylinder, using either a medium or fine fritted glass dispersion tube. You'll need a means of measuring air flow so rates will be reproducible. Use two or three rates—e.g., .03, .05, and .10 cu.ft./min. Both at room temperature and at about 50°C (122°F), observe:

1. Type foam formed (bubble size, apparent consistency).
2. Time required for foam to reach maximum height.
3. Time required for foam to break after air flow is stopped.

Repeat same test on equivalent amine or glycol solutions made up from fresh, unused amine or glycol and compare results. If the plant solution has an appreciably greater tendency to form stable foams of uniformly large bubble size, get ready for trouble.

What about foam inhibitors: Remember, these don't solve the basic problems, but merely give control until you locate the cause of the foam and correct it. Also, how they act may depend on whether they are added *before* or *after* the foam is generated.

For more help, write for "Report on Foaming Problems". We'll also be glad to send you technical data, delivery and price information on Allied Chemical Ethanolamines and Ethylene Glycols.

For specs and local offices, see Chem. Materials Catalog, page 272A; Chem. Week Buyer's Guide, page 27. 2819

Allied Chemical

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NITROGEN DIVISION

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Order your pumping power as you need it . . where you need it . . from a nearby Continental field warehouse. Your order will get immediate attention. You'll get Continental's specialized service, too . . during installation and for the life of the equipment. Yes, you do save when you do business with Continental . . Worldwide!

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CONTINENTAL-EMSCO COMPANY, a Division of The Youngstown Sheet and Tube Company
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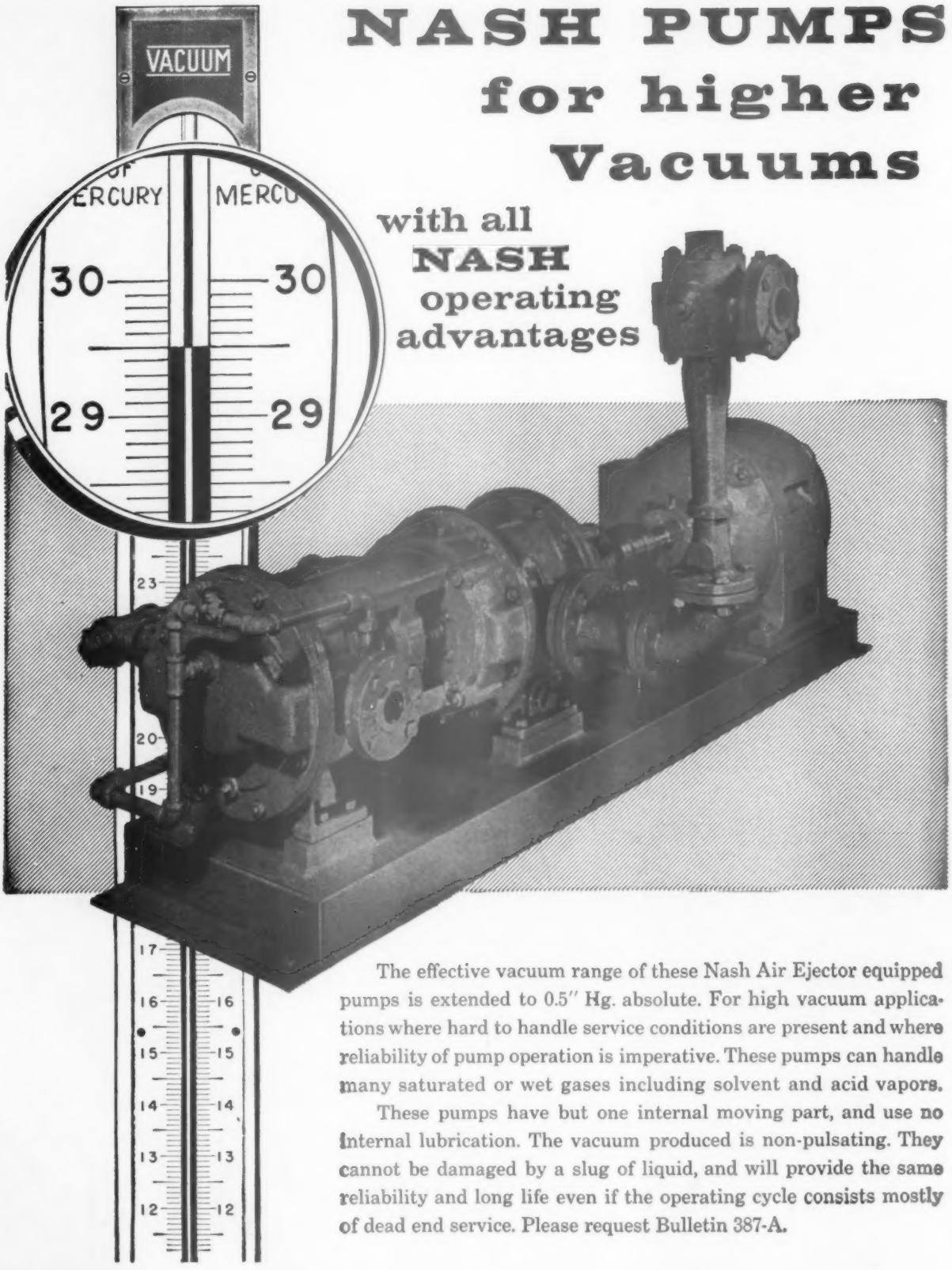
EM21-33

NASH PUMPS for higher Vacuums

with all NASH operating advantages

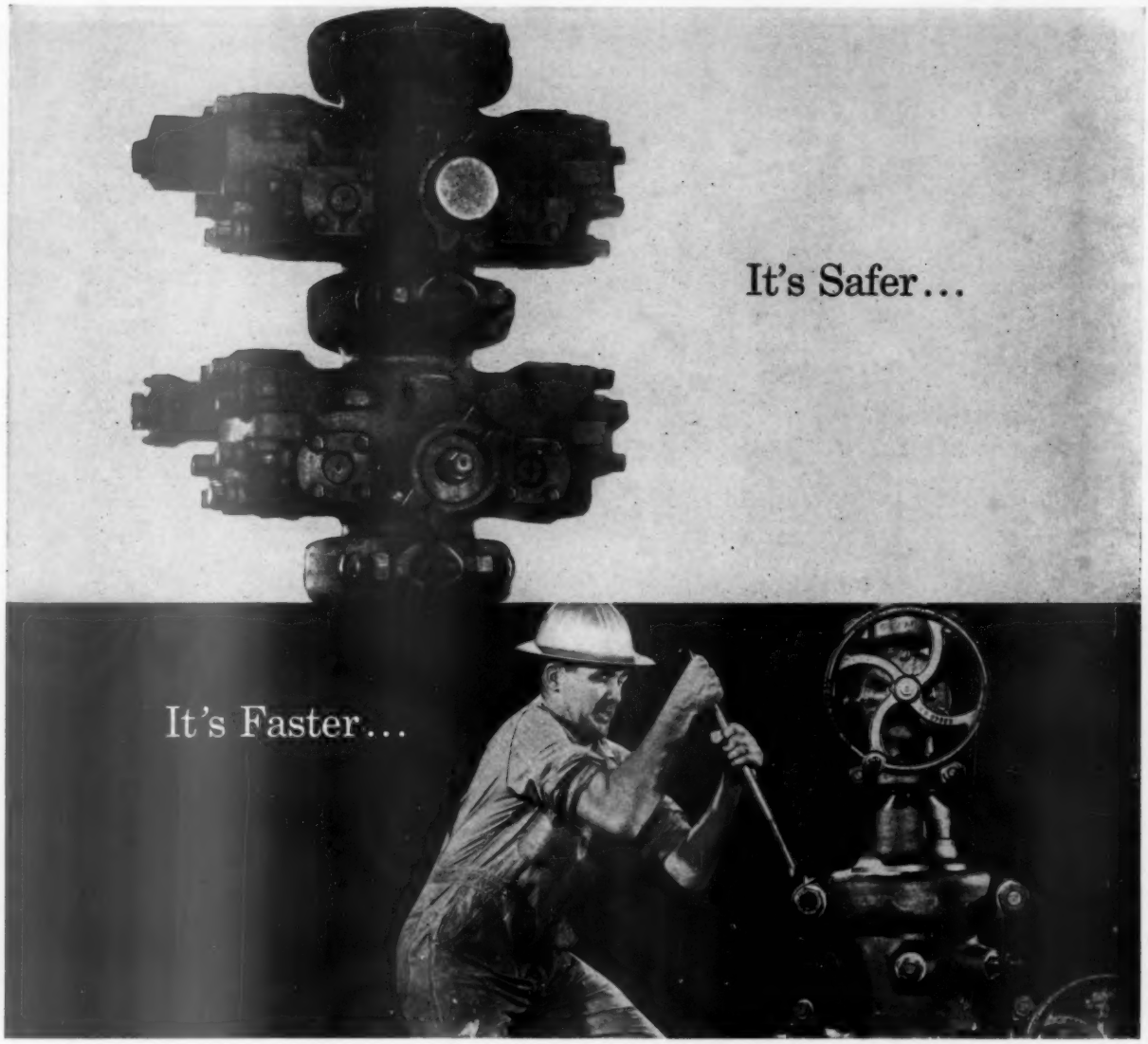


The effective vacuum range of these Nash Air Ejector equipped pumps is extended to 0.5" Hg. absolute. For high vacuum applications where hard to handle service conditions are present and where reliability of pump operation is imperative. These pumps can handle many saturated or wet gases including solvent and acid vapors.

These pumps have but one internal moving part, and use no internal lubrication. The vacuum produced is non-pulsating. They cannot be damaged by a slug of liquid, and will provide the same reliability and long life even if the operating cycle consists mostly of dead end service. Please request Bulletin 387-A.

NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.



It's Better BECAUSE OF GRAYLOC

Gray systems of well control with *Grayloc*® connections have been used on the highest pressure wells so far discovered; and *Grayloc* has enabled Gray Tool Company to design and manufacture the first 40,000 psi test well head assembly.

Grayloc connected assemblies are faster and easier to install, weigh less and are smaller than equally rated flanged assemblies. They resist vibration and remain tight without further attention.

Let a Gray representative show you how *Grayloc* connected well head systems can save space, weight, time and money for you. Write today for additional information and the Gray catalog.

GRAY *Tool Company*

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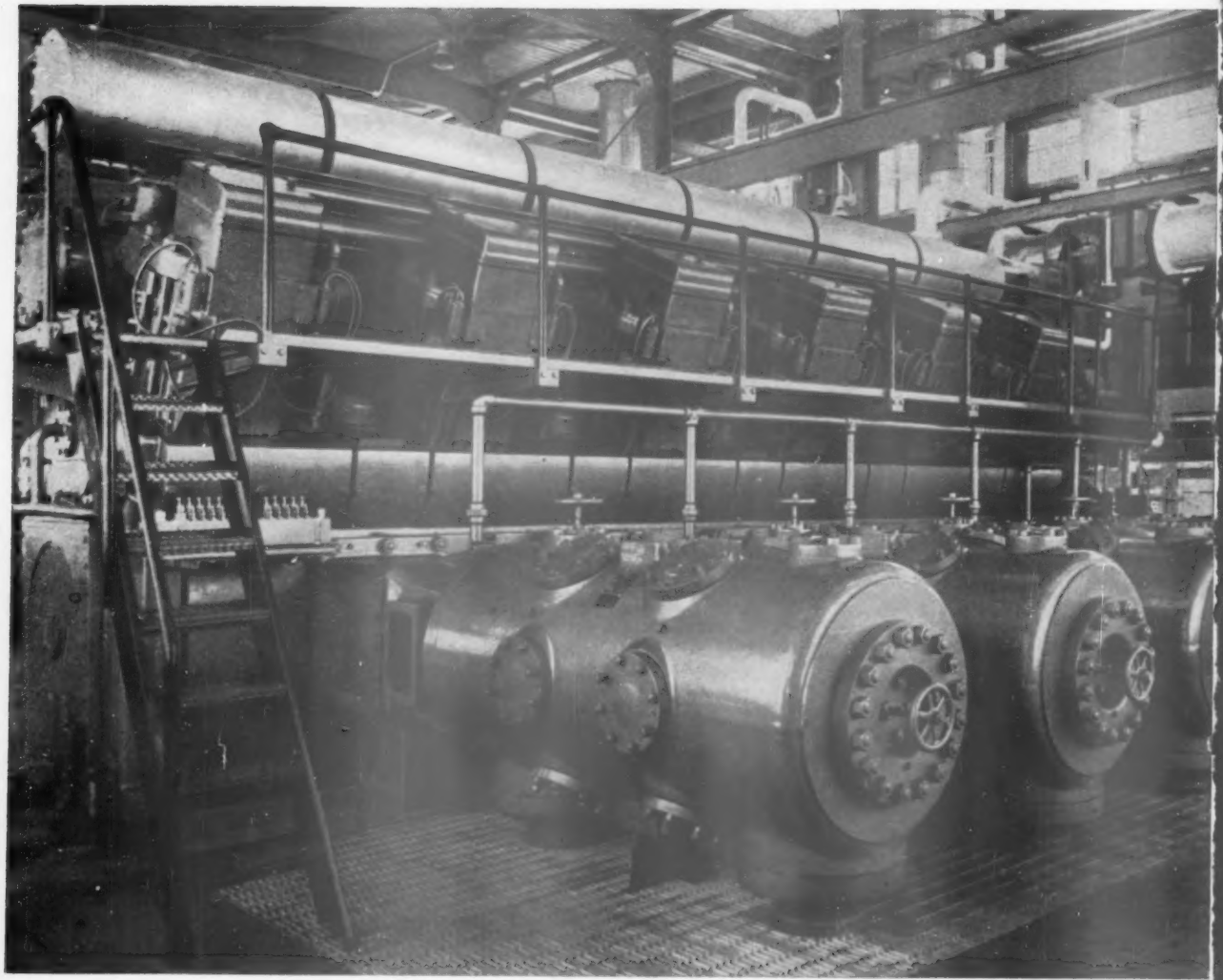


ENGINE EFFICIENCY

KVT

GAS-ENGINE COMPRESSORS

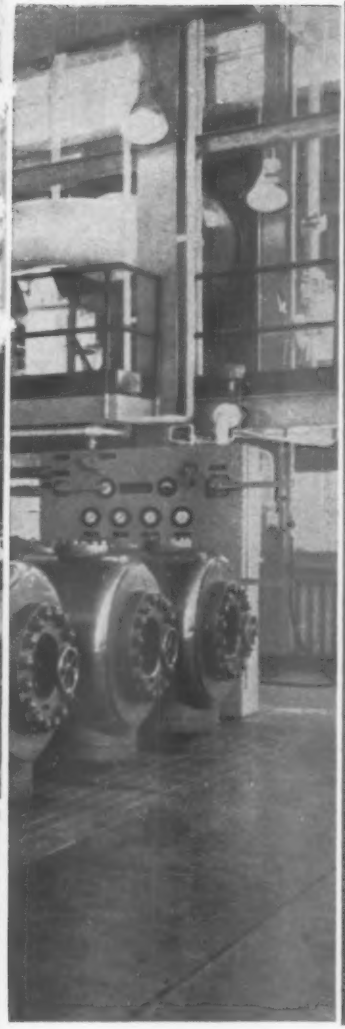
setting a new record in fuel economy for gas-engine compressors...

6300 btu/bhp/hr!

From Ingersoll-Rand's modern compressor plant at Painted Post, N.Y., comes a completely-new line of heavy-duty gas-engine compressors and power units in the 2000-4500-hp class. These powerful 4-cycle V-angle units offer a new high in fuel economy and unmatched flexibility for big-engine jobs on pipelines and in process plants.

The KVT, a completely new design, offers the lowest fuel consumption ever available in an engine-compressor. Using a high-level constant-pressure turbocharging system, it will run continuously at full speed and load with a fuel input of only 6300 btu/bhp/hr!

Also available is the new KVH, similar in size and construction but using a pulse system of low-level turbocharging which results in greater horsepower at a fuel rate of 6900 btu/bhp/hr.



THE WORLD'S MOST EFFICIENT GAS-ENGINE COMPRESSOR...

The first of the new KVT line, this 3000-hp unit with 5 compressor cylinders and 12 power cylinders has been in successful operation in a Louisiana gas pipeline station since December, 1959. More units are now installed on major pipelines in other parts of the U.S.

...FROM THE WORLD'S LARGEST COMPRESSOR FACTORY

Painted Post, N.Y.—the world's largest facility for the manufacture of compressors and engines, newly-expanded with the most modern equipment and skilled personnel. Above is the new "heavy shop", where large engines and engine-compressors are assembled and tested.

in the large economy size!

At the compressor end, the KVT and KVH offer additional advantages: (1) new pipeline cylinder design with bottom intake and discharge connections permits simpler, neater, sturdier installations; (2) cylinders may be placed on both sides of the frame for greater flexibility on process jobs; (3) I-R Channel Valves are unmatched for efficiency and long life.

PKVT and PKVH gas engines, in corresponding sizes, offer efficiency and economy for all prime mover jobs. Where both engines and engine-compressors are used, they give the added advantage of standardized engine and running-gear components for lower inventories and quicker service.

Whether your needs are best met by the unmatched fuel economy of the KVT or the higher power of the KVH, you will find in these revolutionary new units the same service-proved dependability which has characterized Ingersoll-Rand 4-cycle, V-angle engine-compressors from 120 to 2000 hp for years. Your I-R representative is ready to give you more information.

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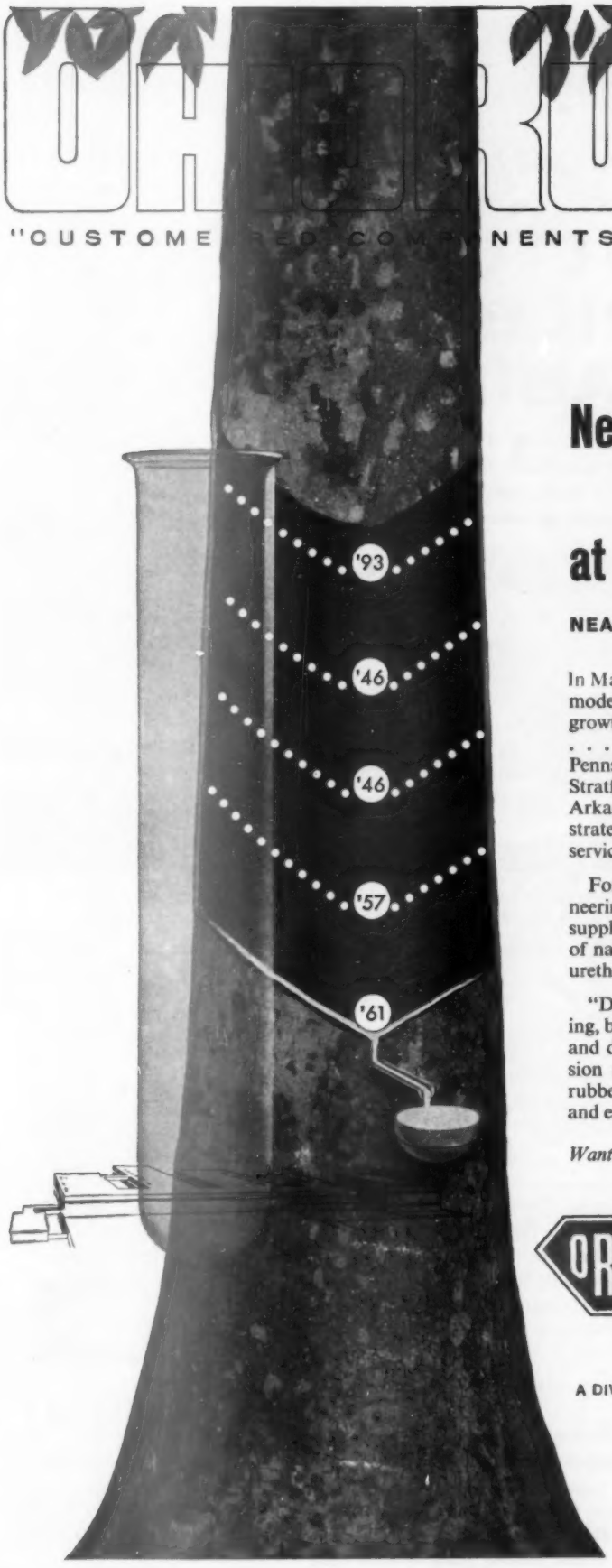
—M. J. Rathbone, President

Standard Oil Company (New Jersey)

(WHOSE PRINCIPAL U. S. OPERATING AFFILIATE IS HUMBLE OIL & REFINING COMPANY)

OHIO RUBBER

"CUSTOMEERED COMPONENTS BASIC TO INDUSTRY"



New rubber plant to tap at Fort Smith, Arkansas

NEARBY SOURCE FOR OIL INDUSTRY!

In May 1961, OHIO RUBBER opened its ultra-modern Fort Smith plant. ORCO's history of growth originated in 1893 at Willoughby, Ohio . . . continues through '46 at Conneautville, Pennsylvania and Long Beach, California—'57 at Stratford, Connecticut—and '61 at Fort Smith, Arkansas. Realization: 5 major, geographically strategic plants . . . all operating on a basis of service to area customers.

Fort Smith's technical facilities, advanced engineering and manufacturing concepts are geared to supply the oil industry with "Customeered" parts of natural and synthetic rubber, neoprene, polyurethane, and flexible and rigid vinyl.

"Direct from factory" services include designing, building and maintenance of precision molds and dies, permanent bonding-to-metal, compression and transfer molding . . . backed by the rubber industry's top technical field assistance and extensive research and development facilities.

Want to know more about ORCO? Write today for Bulletin 730.

MP-881

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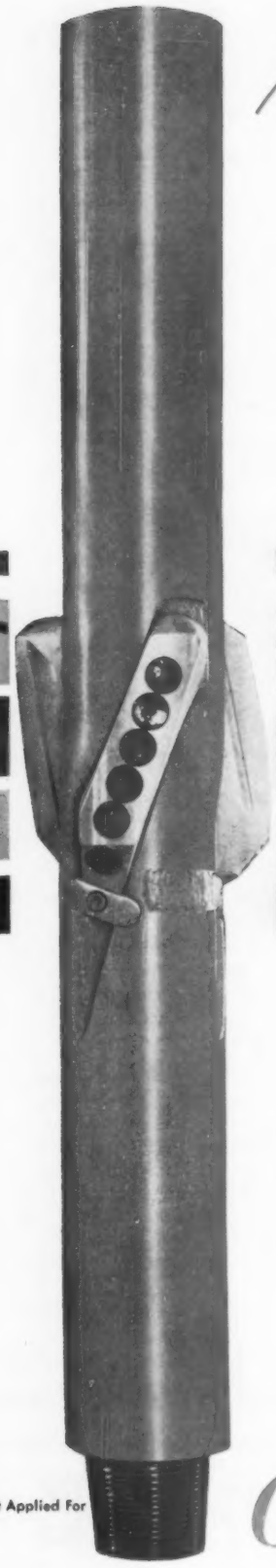
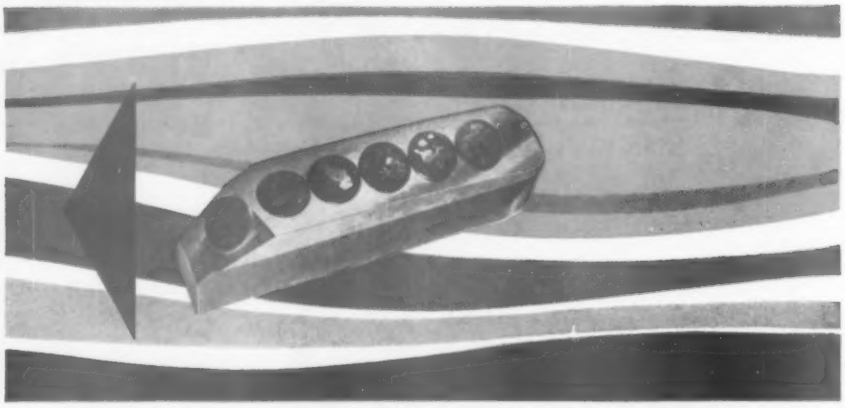
A DIVISION OF THE EAGLE-PICHER COMPANY



New Safety... New Economy...

from GRANT in the BUTTON DRILBLADE STABILIZER!

Now—to the *economy* of drill string stabilization with Grant detachable blade stabilizers—you can add *greater safety than ever before.*



Grant's entirely new concept in blade design is this all-new Button Drilblade* of forged and heat-treated aluminum with press-fitted, individually hard-faced, mild steel inserts. ***It cannot break off or come loose in the hole.***

Longer downhole life of the all-new Button Drilblade is achieved by thicker application of tungsten carbide, made possible by the cupped design of the insert heads. Also, a new type of rod delivers a higher percentage of the hard metal to the bearing surface.

Tensile strength and density of the forged aluminum blade body is further strengthened by the press-fitted steel inserts. Thus, neither the blade nor the inserts can work loose or break off. Yet the blades are easily washed over. Drilblades are retained in the Stabilizer body by tapered slots, engineered so that the blade is actually tightened during use, and by Double-Safety Lock Plates. Removal of Lock Plates permits the blades to be easily changed on the rig floor.

The Grant Drilblade Stabilizer—already the preferred tool for directional drilling all over the world—is now the most dependable tool available for this work.

The new Button Drilblade is fully interchangeable with Grant standard blades. It is available in all body sizes 'round-the-clock from your Grant service man—or write Grant direct for specifications and prices.

*Patent Applied For

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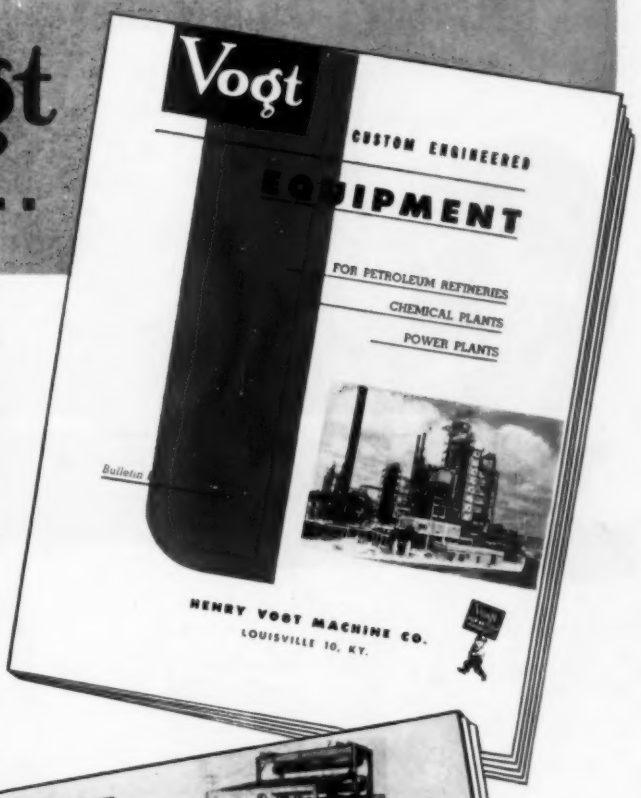

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DELIVERY: Often a challenge!

Delivering this 165 foot, 135 ton fractionating tower on schedule often had its moments.

Built by Sun Ship for a petrochemical company's gas-processing operations, this giant tower presented quite a challenge enroute. Passing through narrow bridges with mere inches to spare, became routine.

But we're used to handling unusual situations. We specialize in designing and building to the most unique requirements. You can be sure of precision engineering and construction on any type of project, from intricate equipment to cargo ships.

Our diversification applies to delivery also. Besides our experience with railroads, being on the hub of the Delaware River makes us a natural for shipment by water.

BUILDING FOR LAND: Pressure Vessels • Fractionating Towers
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Sun

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diversity

A business school prof might call it product diversification to broaden the marketing base, but it all boils down to the basic American drive for a better standard of living. But, all is not so crass! This base broadening business brings *you* the products you need to set your own standards. And since most of our products were designed to meet specific customer demand, we've had a hand jacking up quite a few standards. Before we get too philosophical, let's look at the many things Hoke makes:

1 FORGED NEEDLE VALVES 300 Series:
3000 psi
Brass, 303 SS, 316 SS, Monel
Aluminum ⅛" to ⅜" NPT and with integral tube fittings

2 BAR STOCK NEEDLE VALVES 270 Series:
3000 to 5000 psi
Brass, 430F SS, 316 SS, carbon steel, carbon steel and SS
⅛" to ½" NPT and with integral tube ends

3 PRESSURE REGULATORS 680 Series (gen'l purpose):
Max. delivery press. 140 psig
Max. inlet press. 2500 psig
¼" NPT male needle valve outlet Std. CGA inlet

4 CHECK VALVES 570 and 580 Series:
2000, 3000, 5000 and 6000 psi
Brass, 303 SS
⅛" to ½" NPT and with integral tube fittings.
Ball and piston types

5 SOLENOID VALVES Series 90 (2-way type): Series 95 (3-way type):
Differential press. ratings to 2000 psi
Brass, 303 SS
⅛" and ¼" NPT or JIC tube connections
Choice of coils, housings, corrosion-resistant trim

6 BAR STOCK NEEDLE VALVES 280 Series (metering):
3000 psi
Brass, 316 SS
⅛" and ¼" NPT
1/16" and ⅛" orifice

7 PACKLESS VALVES 473 Series (bellows seal):
400 and 2000 psi
316 SS
½" NPT

8 PRESSURE REGULATORS 920 Series (ballast operated):
Max. del. press. 4500 psig
Max. inlet press. 5000 psig
¼" NPT inlet and outlet

9 FORGED NEEDLE VALVES 100 Series
10,000 psi (WOG)
Weldable forged carbon steel
⅛" to ½" NPT

10 SAMPLING CYLINDERS
Service press. 400 and 1800 psi
304 SS
⅛" to ½" NPT outlet
Single or double valve types
Sizes 10 ml. to 1 gallon

11 TOGGLE VALVES 490 Series (cam-closing):
1000 and 2000 psi
Brass, 303 SS
⅛" to ½" NPT

12 TOGGLE VALVES 450 Series (spring-closing):
200 psi
Brass, 303 SS
⅛" to ⅜" NPT and with integral tube fittings

13 PRESSURE SWITCHES PSG-375 Series:
Operating range 15 psig to 500 psig (max. setting)
Aluminum and SS housing
Proof Press.— 150% max. operating pressure
Burst Press.— 250% max. operating pressure
⅛" NPT port or AND 10056-4, 37½° flare

14 PACKLESS VALVES A431 Series (brass bellows seal):
400 psi
Brass
⅛" and ¼" NPT

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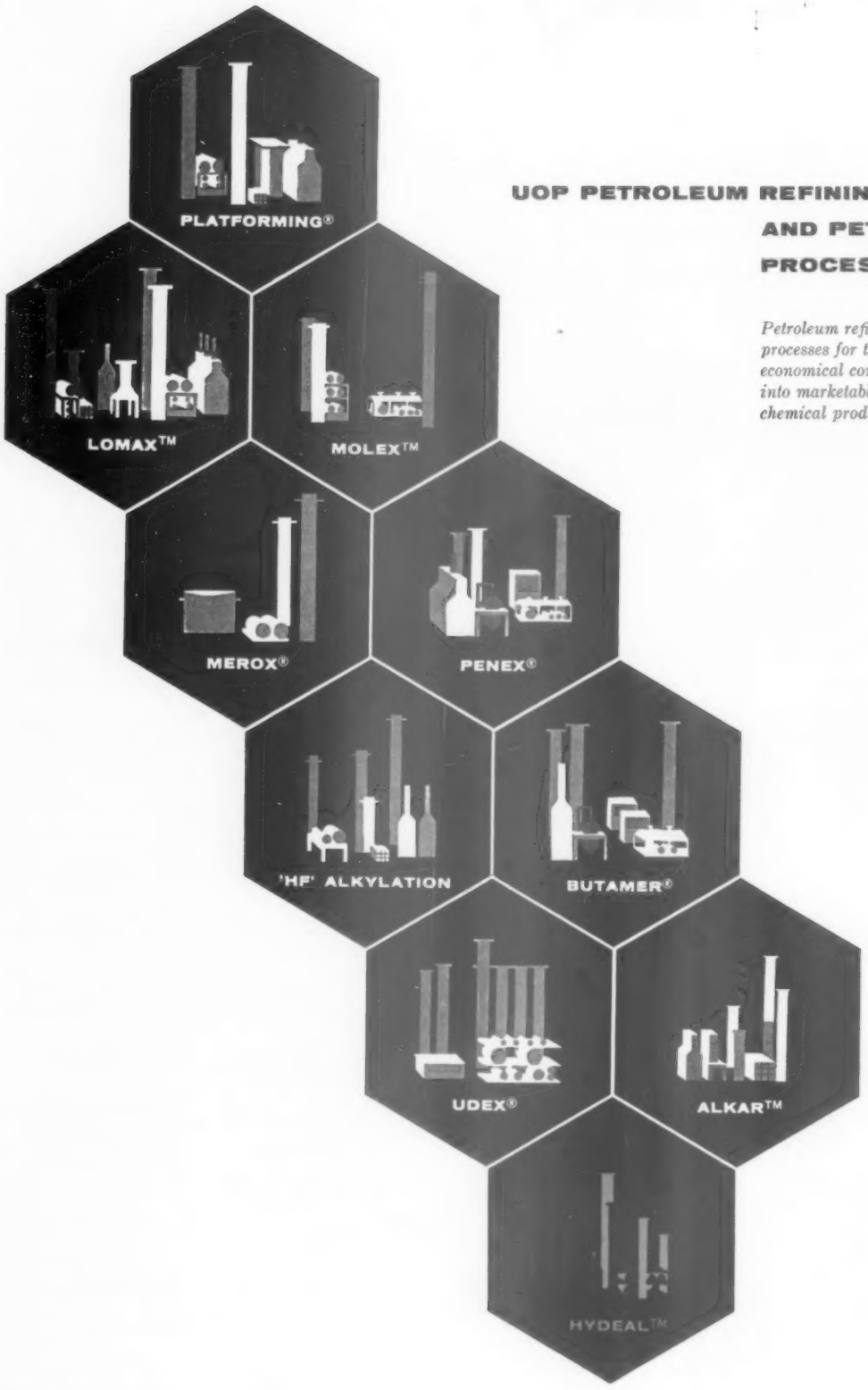

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Petroleum refining and petrochemical processes for the efficient and economical conversion of petroleum into marketable fuel and chemical products.

produce high-grade benzene with Hydeal™

HYDEAL, a new process for the catalytic hydrodealkylation of toluene or xylenes, produces benzene of exceptional purity. Hydeal is also efficiently employed in the production of naphthalene from higher-boiling alkylnaphthalenes.

Hydeal serves a unique marketing need in petrochemical processing. Toluene, xylenes and heavier aromatic mixtures can now be efficiently and profitably converted to higher valued nitration-grade benzene. Benzene market demands by 1968 are expected to grow to more than three times those of toluene and xylenes. Hydeal is ideally suited to meeting this projected growth in benzene demand.

Exceptionally efficient, the Hydeal process, jointly developed by Ashland Oil & Refining Company and UOP, provides excellent yields and operates at economical utility requirements. Benzene yield from the hydrodealkylation of toluene is over 90% of theoretical, while that from xylenes is over 85% of theoretical. Moderate in capital costs, Hydeal offers refiners a ready use for excess toluene and xylenes.

UOP offers a wide range of petroleum and petrochemical processes to refiners everywhere in the free world. A variety of technical sevices is also available to assure the profitable performance of these processes. Let us evaluate your processing needs now.

WHERE RESEARCH IS PLANNED
WITH PROGRESS IN MIND

UOP®

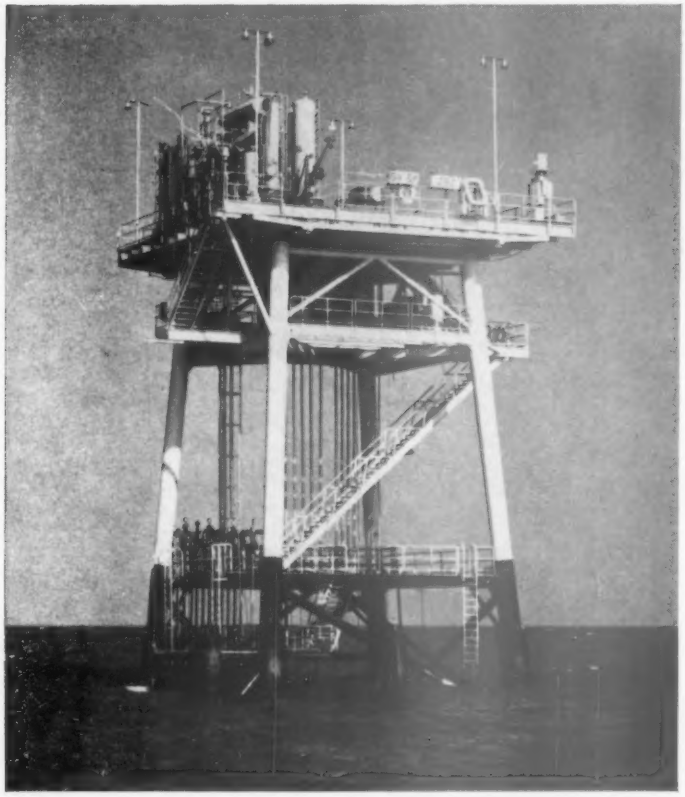
UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.

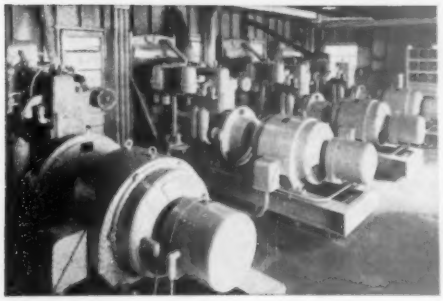
on LAND or on the SEA

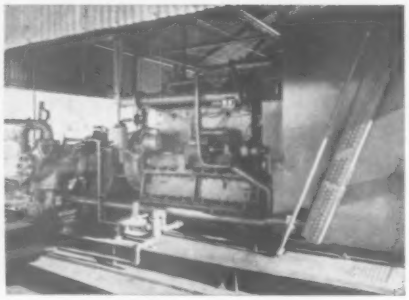
WAUKESHA

power for:

DRILLING • COMPRESSORS
WATER FLOOD • PIPE LINES
PUMPING • ELECTRIC POWER







WORLD'S FINEST OIL FIELD POWER

10 to 1235 hp

BOTH DIESELS AND "BUILT-FOR-GAS" ENGINES

520

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN / **New York • Tulsa • Huntington Park, Calif.**
Factories: Waukesha, Wis.; Clinton, Iowa; Houston, Texas

Bitumastic® No. 50 protects tank for corrosive, swamp-land service

The problem of protection for metal tanks in soils with high moisture content has long been a matter of concern to corrosion specialists: the protective coatings chosen must provide years of maintenance-free service and absolute resistance to corrosive attack by sub-soil moisture. Inspection and repair of buried tanks can be prohibitively expensive.

That's why five petroleum storage tanks, identical to that pictured above, were recently installed at a service station in Secaucus, New Jersey, after a costly failure of older tanks. Bitumastic No. 50 was chosen for heavy-duty protection of these tanks from sub-soil moisture in the loamy Jersey Meadow.

The surface of each tank unit was thoroughly cleaned, and then given a permanent covering of Bitumastic No. 50, the Koppers coating with tough, thick, water-resistant qualities for heavy-duty service.

The unique protective qualities of Koppers coal-tar coatings serve corrosion experts in almost every industrial and marine application. Bitumastic coatings have become synonymous with the finest form of corrosion protection available today. For information on the Bitumastic coating suited to your needs, send the coupon or write: Koppers Company, Inc., Pittsburgh 19, Penna. District Offices: Chicago, Los Angeles, Pittsburgh, New York and Woodward, Ala. In Canada: Koppers Products, Ltd., Toronto, Ontario.

KOPPERS

BITUMASTIC

COATINGS AND ENAMELS

another fine product of COAL TAR

KOPPERS COMPANY, INC.
Tar Products Division
Dept. 104L
Pittsburgh 19, Pa.

Gentlemen:
Please send me more information on the Bitumastic family of protective coatings.

Name_____

Firm_____ Title_____

Address_____

City_____ Zone____ State_____

7 years of constant use . . .

and Davison Silica Gel still meets required dew point

In tower after tower, operation after operation, millions of cubic feet of natural gas are being dried in beds of Davison Silica Gel that were installed two, three and even seven years ago. In one large South Central gas treatment installation, Davison Silica Gel was still effectively removing moisture and maintaining satisfactory dew point after 29,690 consecutive hours on stream.

Davison Silica Gel's proven long-lived efficiency is one of the reasons it is being selected to replace other desiccants in increasing numbers of gas drying and hydrocarbon recovery installations. The higher purity of Davison Silica Gel reduces the possibility of carbon build-up in the desiccant pores. Higher purity, coupled with its larger surface area and granular form, has proven Davison Silica Gel to be an ideal desiccant.

For complete information on the advantages and profit-building potential of Davison Silica Gel for natural gas drying, write Dept. 3111.

GRACE

DAVISON CHEMICAL

Industrial Chemicals Dept. 3111, Baltimore 3, Md.

The plug valve is obsolete . . .

replace it with the **FLO·BALL®!**

The plug valve era is over. They did a fair job while they lasted: easy to operate — 90° on-off — fewer parts than the bulky gate valves. They were expensive to maintain, but they were tight. There was one sore spot, however; maintenance was tough. It often cost more than the valves. Valves froze when they lacked lubrication. Replacing the plug in the field was impossible. Lubricant selection was difficult — contamination of process often took place. At low temperature, lubricants froze, so did the valves.

The **FLO·BALL** was created to solve these problems, still retaining the quarter turn and tight shutoff. The top and bottom guided ball is only in contact with self-lubricating teflon, eliminating lubrication. The **FLO·BALL** never leaks, never freezes, never galls . . . and the torque is the lowest in the industry. Seats seldom need renewing. If anything does happen, the top entry **FLO·BALL** valve can be serviced without removing it from the line, in a few minutes.

The **FLO·BALL** flow path is **always** round. There are no frictional flow losses due to cross-sectional change.

All in all, the **FLO·BALL** is a better valve than the plug. You owe it to yourself to fill your next valve application with **FLO·BALL**. Mail this card for complete information.

Fill in reverse side and mail today!

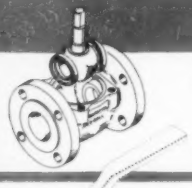
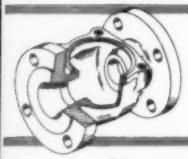
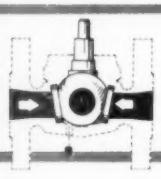
Business Reply Mail
No Postage Stamp Necessary if Mailed in the U.S.

FIRST CLASS
PERMIT #471
BLOOMFIELD
NEW JERSEY

Postage Will Be Paid By

HYDROMATICS, Inc.
Bloomfield, New Jersey

Compare FLO·BALL® feature for feature ... there is no equal!

	FLO-BALL	Ball Valve A	Ball Valve B	Ball Valve C	Ball Valve D	Ball Valve E	
 **1. TOP ENTRY** All internal parts can be removed and re-installed without removing valve from line.	√			√			
2. TOP AND BOTTOM GUIDED BALL Provides truly double seal, extends seat life. Makes for easy operation.	√						
3. DOUBLE SEATS Interchangeable and replaceable seats insure sealing in both directions; give double protection against leakage.	√	√	√	√	√	√	
 **4. FLANGES INTEGRAL WITH BODY** Rugged, one-piece body design gives greatest possible strength.	√	√		√			
5. ONE PIECE BALL AND STEM No possibility of separation of ball from stem. Always perfect alignment with zero backlash. Foolproofed for assembly.	√						
 **6. BLOCK AND BLEED** Top and bottom guided ball and floating seats provide simultaneous up-stream and down-stream seal . . . a true block and bleed valve. Block and bleed type available on special order.	√						

Specify the FLO • BALL for your application

	SCREWED ENDS	FLANGED ENDS
Sizes	⅛" — 2"	1" — 36"
Pressures	Vacuum — 600# — 3000#	150# — 300# — 600# (ASA Rating)
Materials	Carbon Steel, Stainless Steels, Semi-Steel, Brass, Alloy 20, Monel	
Operators	Manual, Hydraulic and Motor	
Your Choice of FLO-BALL Types	Two-Way, Three-Way, Fire-safe, High Pressure (to 10,000 psi), Cryogenic, etc.	

Gentlemen:

I am interested in getting complete information on FLO-BALL valves.

My application is_____.

☐ *Send sales engineer* ☐ *Send literature*

Name_____ Title_____

Company_____

Street_____

City_____ State_____

1 2

FLO-BALL

Hydromatics, Inc.

BLOOMFIELD, NEW JERSEY

Fill in this card ... mail today!

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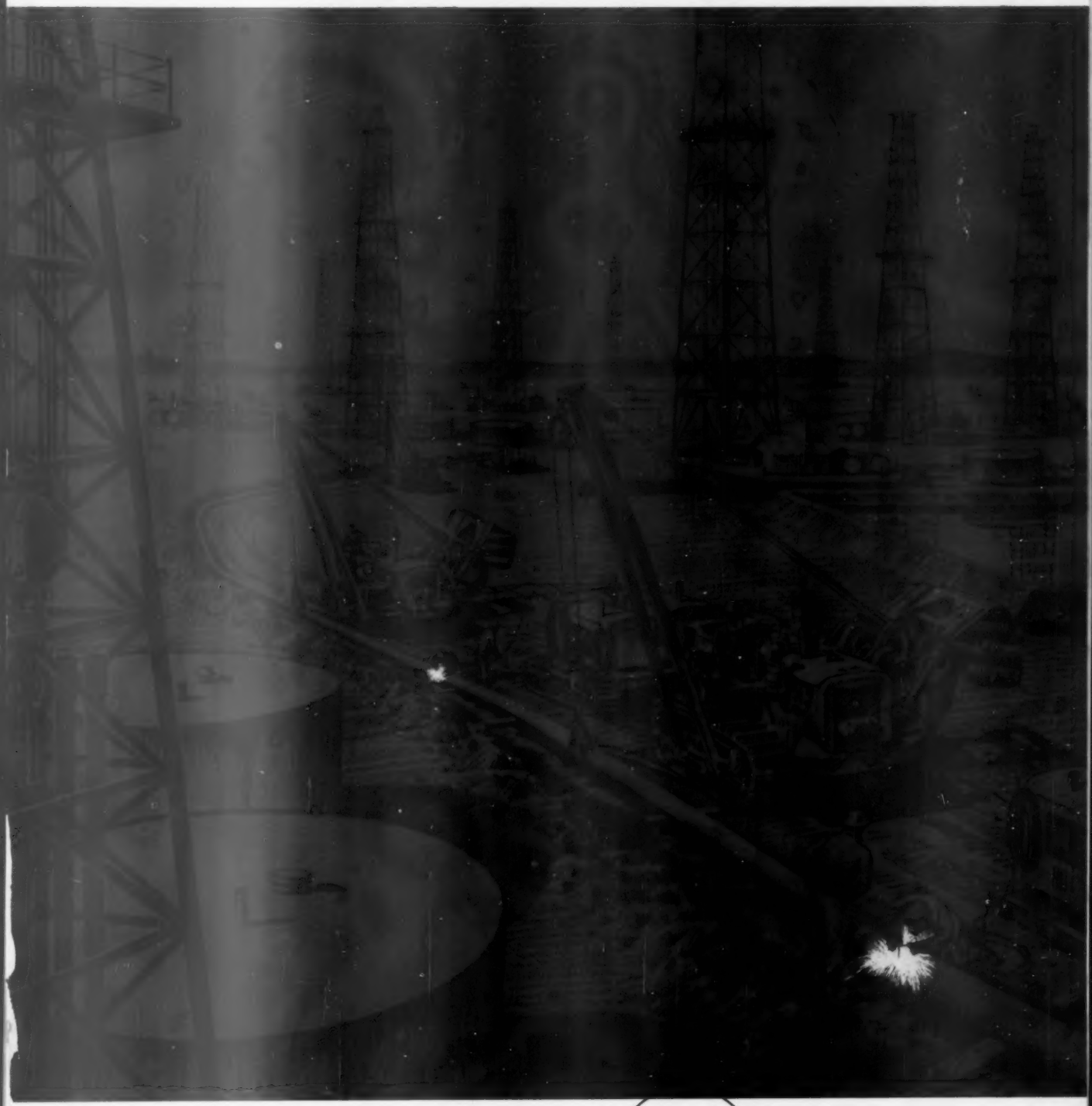
FROM THE HUGOTON FIELD TO SUBURBIA



Regardless of the purpose of the pipeline or where it's built, STUPP CORPORATION **high-yield strength, lightwall steel line pipe** offers more advantages. Easier and faster handling, fewer field welds, all-around economies at highest industry standards. Lengths up to 64 feet in the 6⅝-inch to 16-inch range for natural gas gathering, transmission, and distribution pipelines. Write or wire for a quotation.

STUPP CORPORATION

MANUFACTURER OF CUSTOM STEEL LINE PIPE
FOR THE OIL AND GAS INDUSTRY

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SALES OFFICES: BATON ROUGE, LOUISIANA • HOUSTON, TEXAS • DALLAS, TEXAS • TULSA, OKLAHOMA
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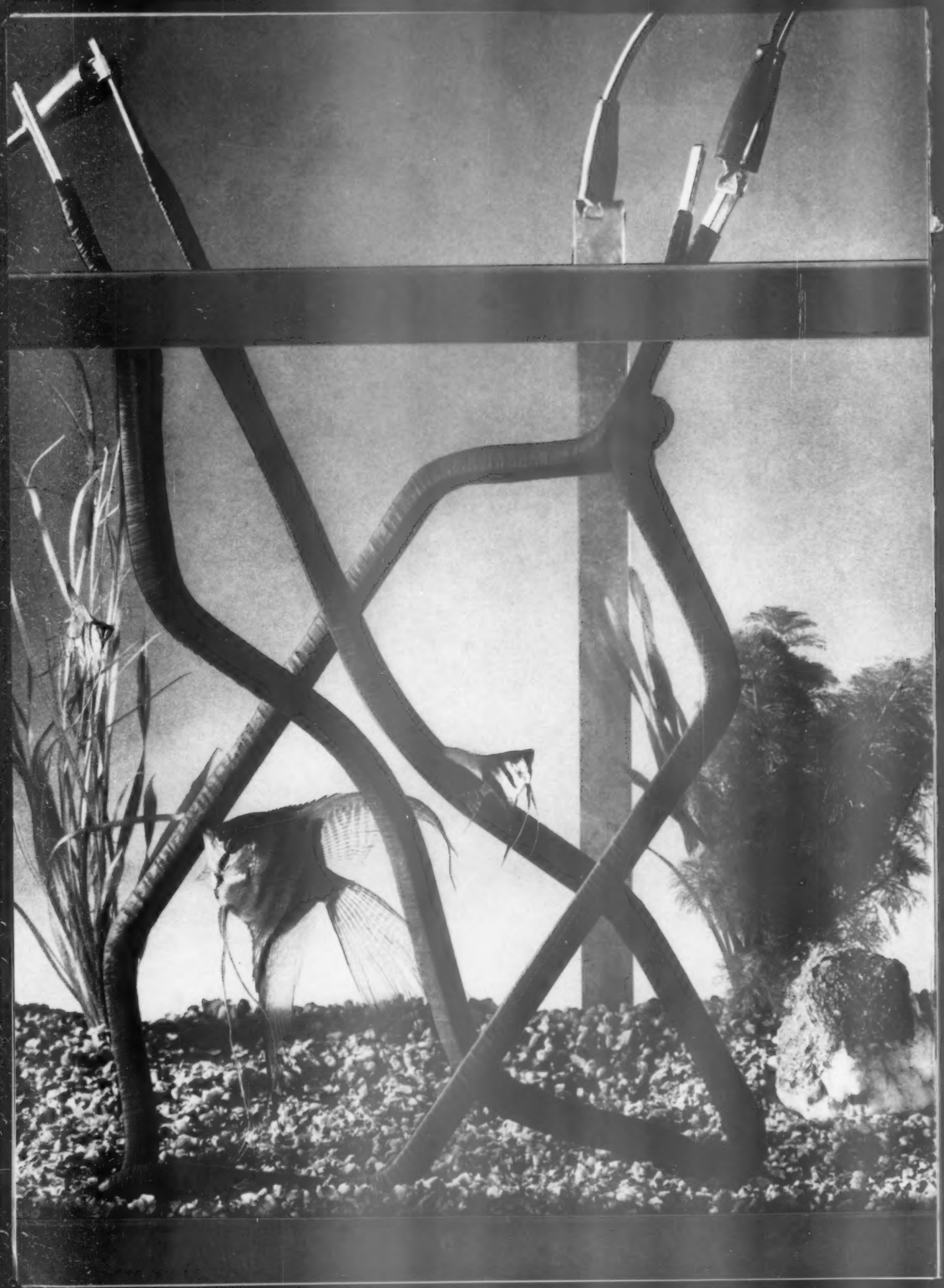


Can Your Motor Coils Pass This Test?

E-M Sealflex...

the exciting new flexible epoxy insulation system does!

Sealflex is fully sealed and flexible to provide you with a worry-free coil insulation that protects against water, salt air, dirt, oil, chemicals, solvents and carbon black.

The motor coils on the opposite page are wound with Sealflex. One coil is an undistorted, normally formed coil. The other is bent into a figure 8 to demonstrate the extreme flexibility of the insulation. These 2300-volt coils successfully underwent a water immersion test at more than three times rated voltage! We know you won't be operating your E-M Motor or Generator in an aquarium, but this test demonstrates how a machine of Sealflex-protected coils can minimize your insulation worries.

This amazing, *flexible epoxy* form wound coil insulation system is the result of an extensive, long time program of sealed insulation research between the Irvington Division of Minnesota Mining & Manufacturing Co. and the Electric Machinery Mfg. Company. Fibremat* brand, a flexible B-Stage epoxy insulation, is a product of the world renowned tape research and fabrication facilities of the Minnesota Mining organization. The Sealflex coil is the product of E-M's team of skilled insulation experts . . . backed by more than 60 years of insulation know-how.

Fully-Sealed Protection

Sealflex is a completely sealed system. Each coil is precision wrapped with the newly developed, self-sealing, flexible B-Stage epoxy "Fibremat" brand tape. Curing at 400 F produces a thick, molded-on, tough sheath of high-dielectric strength insulation.

This full sealing, plus the stable characteristics of the epoxy base, make Sealflex especially resistant to tough ambients such as moisture, salt air, dirt, oil, solvents, chemicals, black liquor and carbon black.

Flexible for Long Coil Life

The resilience and toughness of Sealflex is permanent . . . permits the coils to flex with starting loads and to withstand repeated elongation and contraction due to changes in operating temperature. There is no tendency to brittleness and fracturing previously experienced with ordinary epoxy-base insulations.

The abrasion resistance of this new insulation is superior to conventional Class B materials. And its excellence in high dielectric strength and thermal stability contribute to increased reliability and long coil life.

Minimum Upkeep

Because of the super-sealing and moisture-resistant characteristics of Sealflex, there is no need to dry out the machine before startup after a prolonged shutdown. Maintenance is further reduced by the smooth epoxy hide which resists penetration of dust, dirt, and carbon black particles. It cleans easily with air hose or cloth and solvent.

Another first from E-M . . . Sealflex . . . a complete, integrated system designed to provide you with worry-free machine insulation for 130 C (Class B) service in the 600, 3000, and 5000 volt classes.

Get Your Free Brochure

Find out more about the Sealflex System in a new brochure that tells how modern chemistry and modern insulation research made E-M Sealflex best for *flexible*, fully-sealed coil protection from the especially tough ambients involving water, steam, humidity, salt air, dirt, oil, solvents, chemicals, black liquor and carbon black. Ask your nearest E-M Sales Engineer for your copy, or write directly to Electric Machinery Mfg. Company, Minneapolis 13, Minnesota.

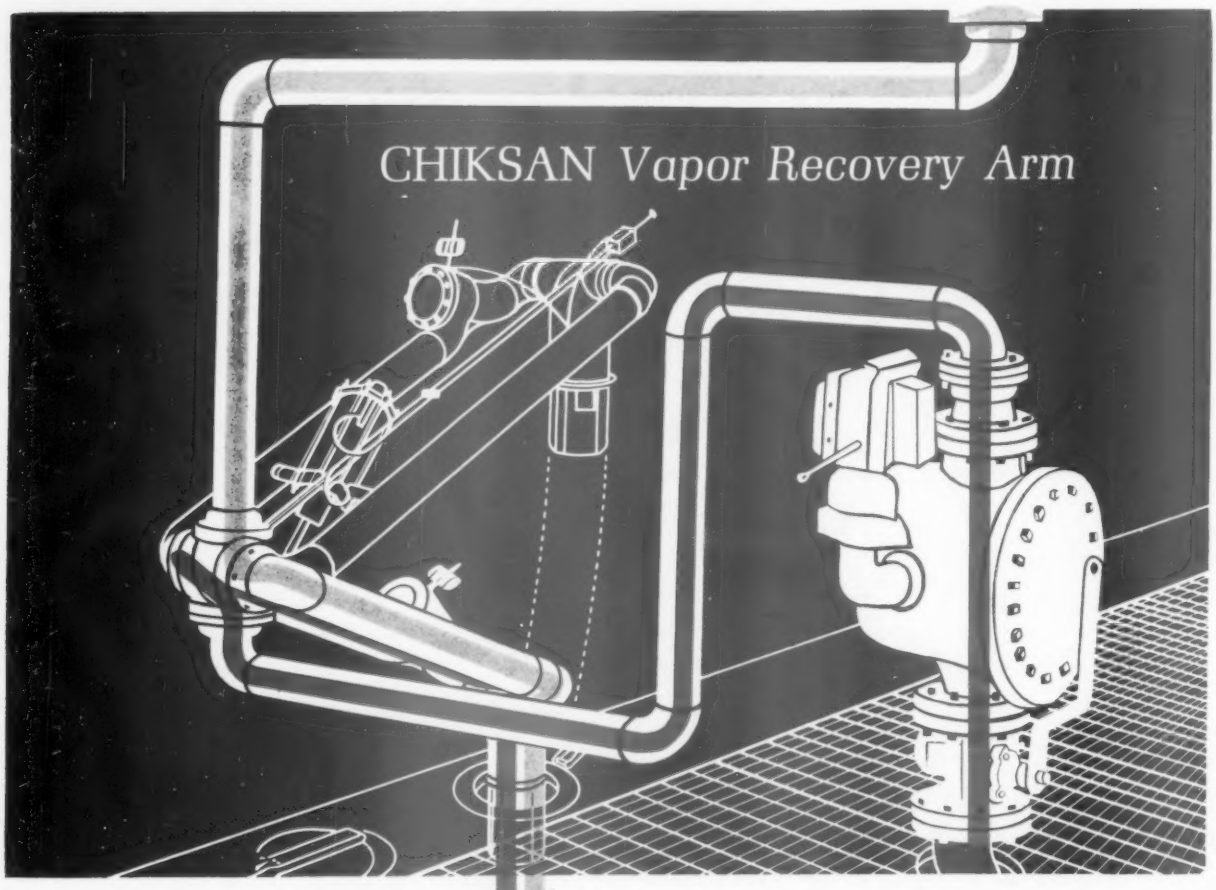
*A registered trademark of the Minnesota Mining & Manufacturing Co., St. Paul 6, Minn.

Specialists in making insulation do exactly what you want it to

E-M

200-TPA-2224

Induction Motors • Synchronous Motors • Motor-Generator Sets
High-Cycle Generator Sets • Water Wheel-Driven A-C Generators
Adjustable-Speed Magnetic Drives • Engine-Driven A-C Generators
Turbine-Driven A-C Generators • Motor Controls • Generator Switchgear



NOW

A new Loading Arm

that collects the vapors as you load!

CHIKSAN, pioneer developer of the ball-bearing swivel joint, now introduces the first complete vapor recovery arm assembly. This compact one-piece arm operates as an integral unit to load volatile fluids, collect the resulting vapors and transfer these vapors to a condenser.

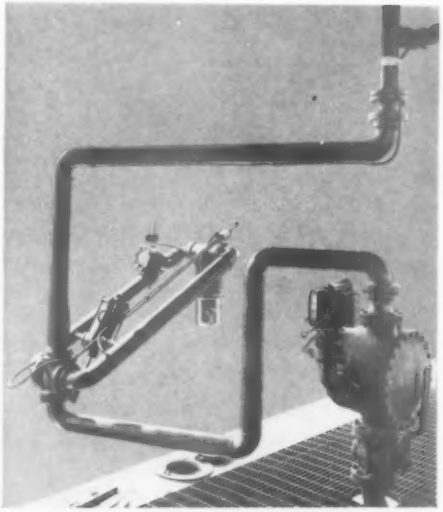
The CHIKSAN arm operates like a standard loading arm. With its semi-automatic design, the operator merely guides the vapor head into the tank dome and opens the main valve:

A positive leak-proof seal is maintained at all times.
Automatic shutoff prevents overfilling.
Vacuum breakers insure complete fluid-line drainage.
Vapor recovery is practically 100%.
Pneumatically controlled motion is smooth and rapid.

Loading capacity is about 30% greater than other types of vapor recovery systems. All parts are rugged and easily maintained.

CHIKSAN Vapor Recovery Arms have been accepted and approved for operation in the Los Angeles area where strict air pollution control regulations exist.

Call your CHIKSAN salesman, or write us for engineering specifications.



Brea, California **CHIKSAN**

A subsidiary of FMC Corporation

Well Equipment Mfg. Corp. Division (Weco Unions, Hamer Valves) Chiksan International • Chiksan of Canada Ltd. • Offices and Representatives in Principal Cities of the World

fmc CORPORATION ®

61-66

"Made OF Stainless Steel ...Made BY Jenkins"

And the "BY" is the most important word in that Spec!

Let's talk sense about stainless steel valves.

The material, the metal itself, is pretty much a cut-and-dried matter of *specifications* — selecting the right metal for a particular application. After all, the same alloys are available to *all* valve manufacturers!

But —

Just as is the case with iron or bronze valves, the basic and essential difference is in the *way* valves are made. *Perfection of castings . . . precision machining . . . sound design . . . painstaking inspection and testing —*

These are the really meaningful, the sense-making factors which impel more and more buyers to specify "BY Jenkins," along with the specification for a particular alloy.

At Jenkins every operation, every process, every test, every worker — all combine to fulfill the traditional (almost 100 years old!) standard of Jenkins quality — the very highest, the *standard* of quality for valves.

SEND FOR CATALOG 59-SS of Jenkins Stainless Steel Valves in types and alloys to fill 99 out of 100 application requirements. All made the Jenkins way to give you the longest, most dependable valve performance money can buy. Jenkins Bros., 100 Park Ave., New York 17.

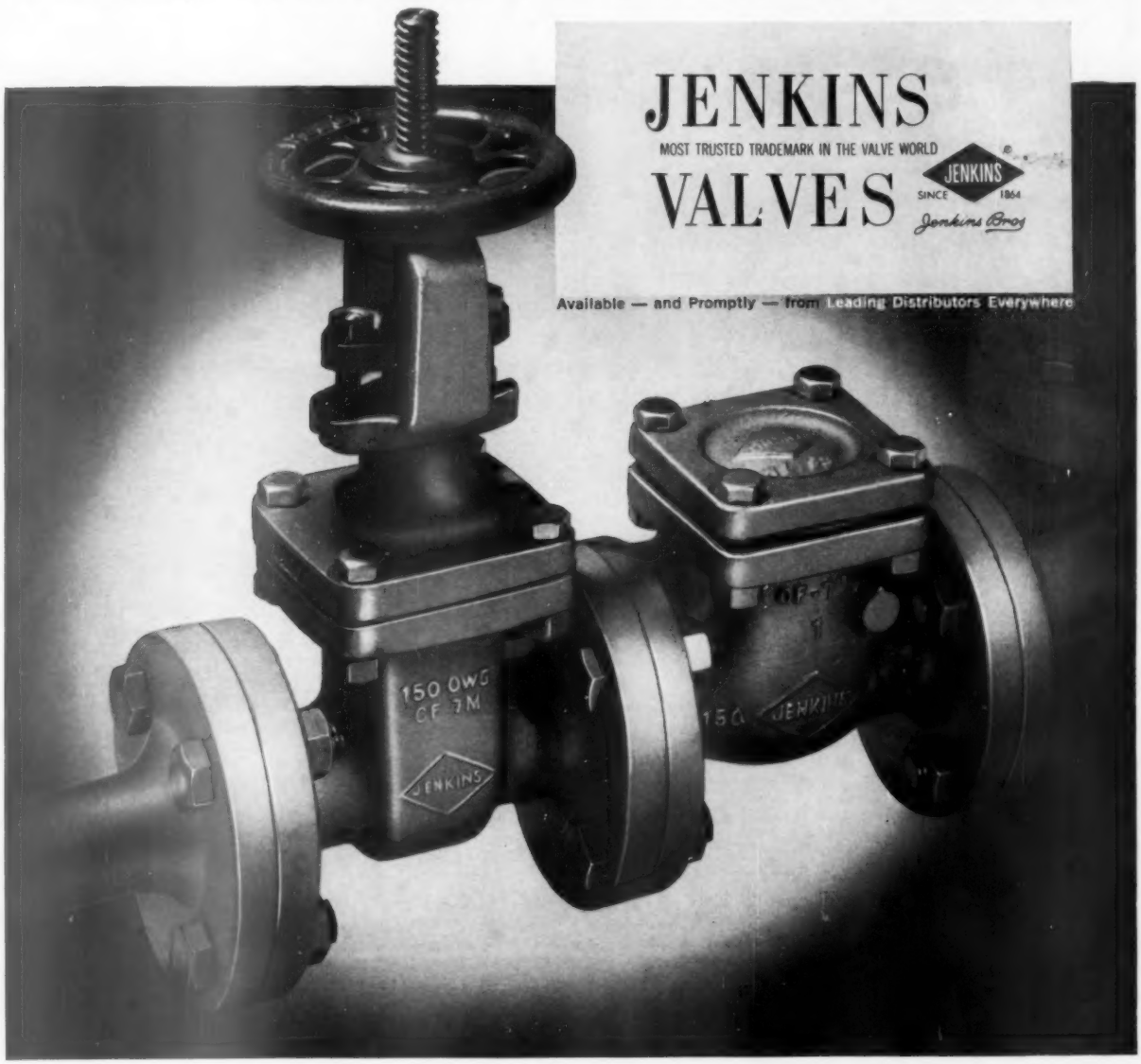
JENKINS

MOST TRUSTED TRADEMARK IN THE VALVE WORLD

VALVES

JENKINS SINCE 1864 Jenkins Bros

Available — and Promptly — from Leading Distributors Everywhere



KELLOGG Leads Repeatedly

in Cat Cracking....

EXTENSIVE EXPERIENCE AND IMPROVED DESIGN ASSURE OPTIMUM UNIT FOR ANY NEED...

A substantial portion of today's total fluid catalytic cracking capacity bears the imprint of Kellogg engineering and construction techniques. This unparalleled experience, coupled with improvements in Orthoflow® design, enables Kellogg to provide the optimum unit to meet any need in any part of the Free World.

Kellogg's leadership in cat cracking is based upon a continuing program of design improvement. Both in the company's New York engineering offices and Jersey City laboratories, Kellogg specialists have achieved numerous improvements in product quality and yields while reducing investment, utility, and catalyst costs.

The latest developments in Kellogg's Orthoflow design permit use of greater variety of feedstocks and provide improved product distribution, more operational flexibility, and still higher yields of gasoline and lower yields of coke—all with less capital investment and upkeep than ever before.

Whatever your cat cracking needs . . . modernization . . . expansion . . . completely new facilities . . . Kellogg welcomes the opportunity to discuss how it can work to your economic advantage.

THE M. W. KELLOGG COMPANY

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Subsidiary of Pullman Incorporated

THE CANADIAN KELLOGG COMPANY, LIMITED, TORONTO
KELLOGG INTERNATIONAL CORPORATION, LONDON
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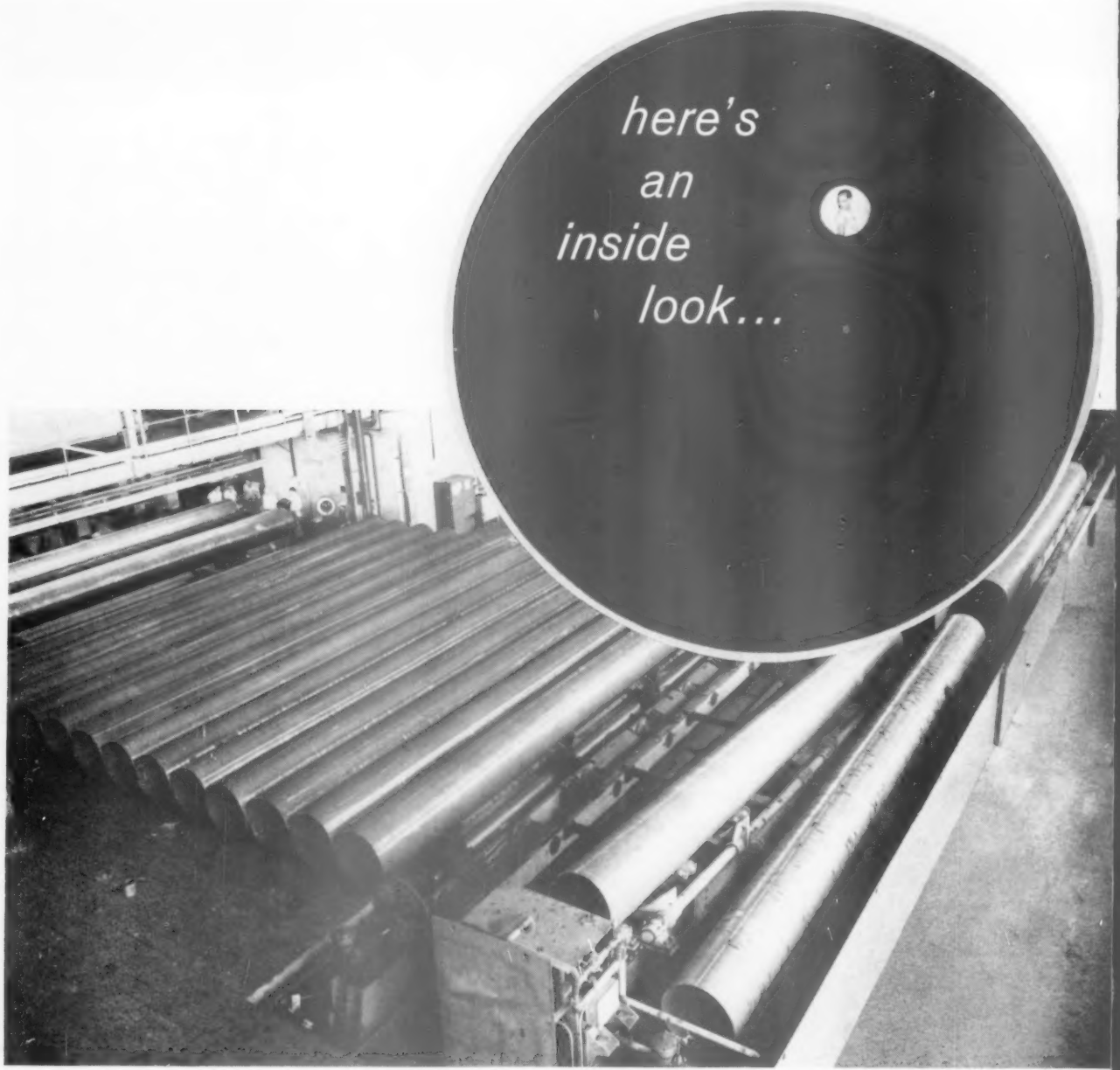
KELLOGG PAN AMERICAN CORPORATION, BUENOS AIRES
COMPANIA KELLOGG de VENEZUELA, CARACAS
COMPANHIA KELLOGG BRASILEIRA, RIO DE JANEIRO

LOCATION	TOTAL THRUPUT BPD
Edmonton, Alberta	3,784
Ponca City, Oklahoma	24,480
Sarnia, Ontario	14,027
Gelsenkirchen, Germany	5,000
Amarillo, Texas	9,706
Sisak, Yugoslavia	3,332
Toledo, Ohio	17,705
Smiths Bluff, Texas	26,625
Philadelphia, Pennsylvania	45,000
Clarkson, Ontario	45,000
Kwinana, Australia	12,500
St. Boniface, Manitoba	9,837
Enid, Oklahoma	19,330
Delaware City, Delaware	101,850
Yorktown, Virginia	30,618
Puerto La Cruz, Venezuela	14,290
Mataripe, Brazil	20,493
Vancouver, British Columbia	13,500
Montevideo, Uruguay	7,000
Concon, Chile	14,400
Mendoza, Argentina	18,783
Borger, Texas	34,830
Texas City, Texas	95,160
Istanbul, Turkey	9,380
Baton Rouge, Louisiana	17,000
Baytown, Texas	14,700
Baton Rouge, Louisiana	15,500
Dominques, California	18,700
Aruba, Netherlands W.I.	15,000
Baltimore, Maryland	15,000
Wood River, Illinois	17,050
Port Arthur, Texas	22,000
Lake Charles, Louisiana	23,400
Parco, Wyoming	9,350
Lake Charles, Louisiana	16,286
Texas City, Texas	17,050
Port Arthur, Texas	17,050
Wood River, Illinois	17,600
Salt Lake City, Utah	14,500
Lake Charles, Louisiana	17,435
Sarnia, Ontario	29,000
Baton Rouge, Louisiana	15,500
Baytown, Texas	15,500
Wood River, Illinois	10,000
Whiting, Indiana	20,000
Wilmington, California	16,275
Dinslaken, Germany	10,000
Philadelphia, Pennsylvania	21,030
Casper, Wyoming	6,000
Whiting, Indiana	67,710
Lockport, Illinois	22,400
Sugar Creek, Missouri	20,000
Heath, Ohio	5,000
Montreal East, Quebec	30,358
Tulsa, Oklahoma	16,200
East Chicago, Indiana	46,500
Casper, Wyoming	8,000
Port Arthur, Texas	90,000
Montreal, Quebec	11,000
Toledo, Ohio	30,635
Eagle Point, New Jersey	33,250
West Tulsa, Oklahoma	19,523
Cincinnati, Ohio	19,375
El Dorado, Kansas	22,810
Montreal East, Quebec	21,588
Lawrenceville, Illinois	35,150
Port Arthur, Texas	67,093
Winnipeg, Manitoba	3,740
Grangemouth, Scotland	13,000
Llandarcy, Wales	17,930
Isle of Grain, England	13,500
Philadelphia, Pennsylvania	63,750
La Plata, Argentina	26,165
Port Arthur, Texas	68,000
Gonfreville, France	31,370
Campana, Argentina	14,040



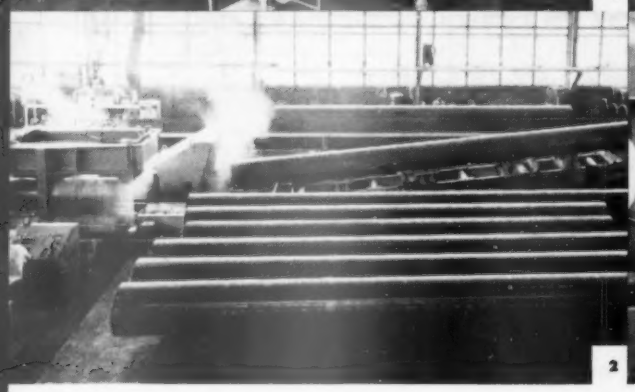
INSIDE STORY — Production line coating permits direct operation and supervision by A. O. Smith personnel, maximum automation and quality control and the protection of the already pickled internal surface of the pipe from adverse weather conditions.

Pipe coating equipment of a completely new design all under one roof! At Houston as well as Milwaukee you can take advantage of internal coating of 16″ through 36″ line pipe to your specifications — the complete automated process takes place in fully enclosed buildings supervised by expert A. O. Smith personnel.

And as in Milwaukee, equipment and operations have been specially designed to give particular attention to the cleaning and preparation of the pipe surface prior to actual coating. This follows A. O. Smith's belief that the best coating results are obtained from an originally clean, pickled surface, and that coating applied to such a surface will yield maximum benefits to the user.

industry's most modern internal coating facilities at A. O. Smith Corporation of Texas

1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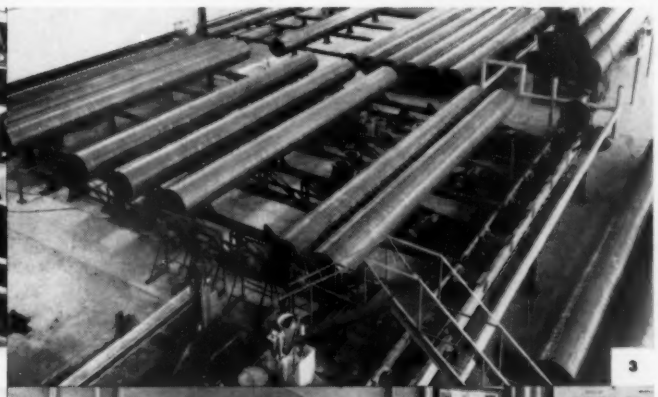
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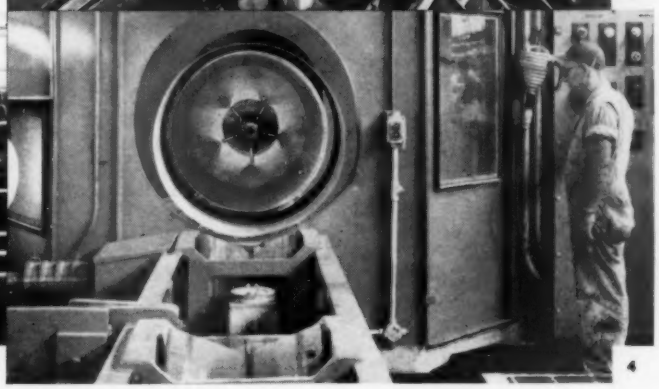
4

ALL UNDER ONE ROOF

1 DOUBLE SCRUBBING — Pipe is brushed on both forward and reverse cycles. On the forward cycle the pipe is wire brushed with a hot detergent solution. On the reverse cycle a clear hot water spray is used.

2 HOT RINSING — Water heated to 180° is used for the wash out operation. Pipe is elevated to drain rinse water while heated air is blown through to speed drainage and drying.

3 CONVEYING AND DRYING — After completion of the hot rinsing and wash out operation, the pipe dries as it is slowly conveyed to a holding station just outside the coating area.

4 COATING—Airless spray equipment applies the coating within an 8'x8', dust-free steel enclosure. The entire coating area is separated from the rest of the mill by an "air curtain" created through pressure reduction.

Through research ...a better way

A.O.Smith
CORPORATION
TUBULAR PRODUCTS DIVISION
Milwaukee 1, Wisconsin

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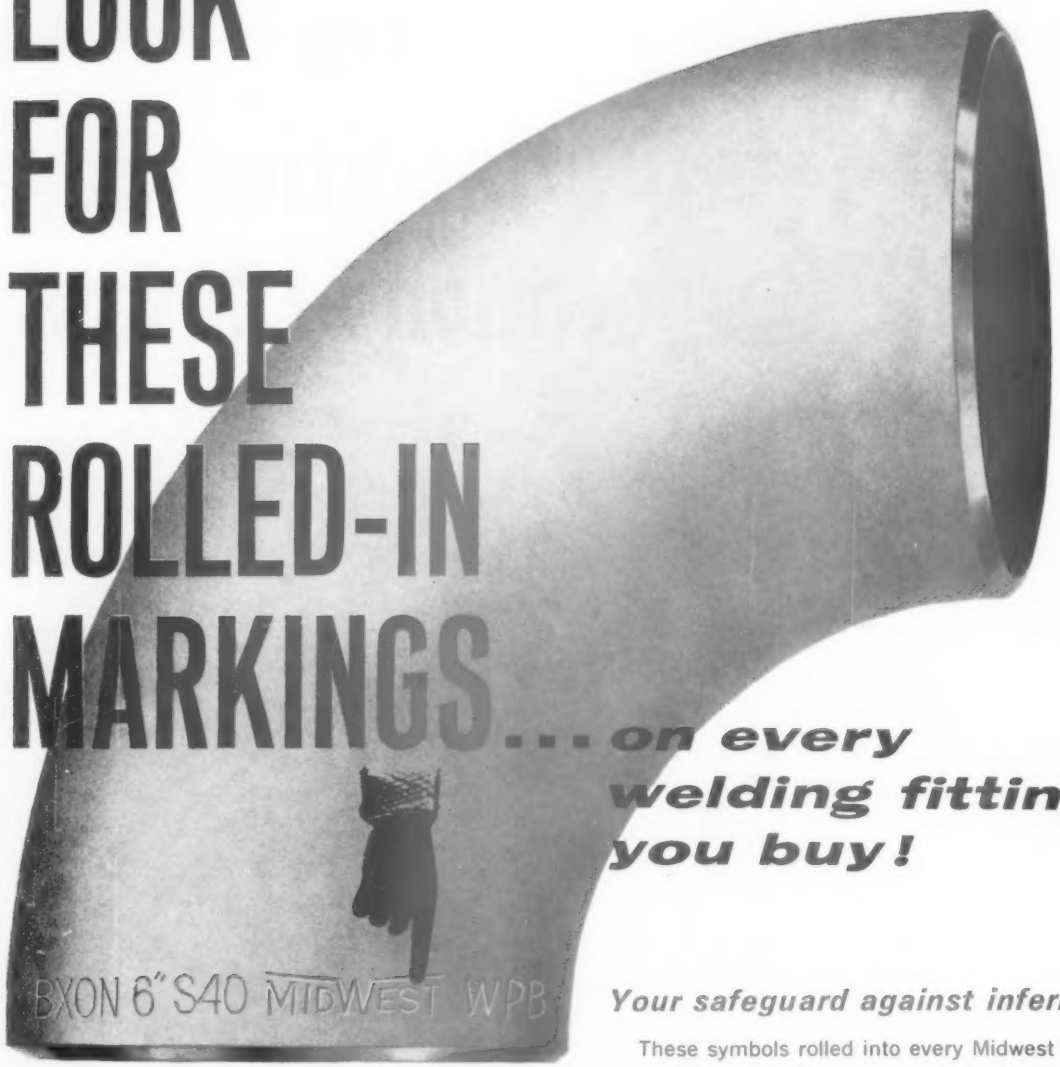
LOOK FOR THESE ROLLED-IN MARKINGS... on every welding fitting you buy!



BXON—HEAT SYMBOL—Used to identify physical properties, chemical analysis of raw material, radiographic control testing, and heat treatment.

6" S40—SIZE AND WALL THICKNESS

MIDWEST —TRADE MARK—Your Midwest distributor's guarantee of brand-new fittings made from prime domestic steel.

WPB GRADE OF STEEL—Your identification of the grade of steel... and your assurance that each Midwest fitting is made in full compliance with ASTM and ASA standards.

Your safeguard against inferior quality

These symbols rolled into every Midwest fitting are your guarantee of brand-new fittings made from prime domestic steel in full compliance with ASTM and ASA standards!

Even the markings are made with specially designed low-stress dies to preclude injury to the steel. Care such as this demonstrates Midwest's sincere determination to manufacture fittings of highest quality throughout... unmatched anywhere!

Write for Bulletin 60C, ONLY MIDWEST MAKES BOTH, the story of how superior quality fittings are made from either seamless tubing or rolled plate.

MIDWEST PIPING

A Division of Crane Co. / 1450 South Second St., St. Louis 4, Mo.

Tie the Drawworks with Guts onto your Rig

With a Brewster drawworks in place,
you've got the iron for the job.
Robust as a bulldozer,
yet as sure and responsive as a sports car.

TAKE BREWSTER'S N-45 ROTARY RIG DRAWWORKS

Depth rated to 6,500 feet with 4½" drill pipe, it is no less rugged than the big ones. Smaller . . . yes, and lighter, too. But the guts are still there. And you and your drillers will know it every foot of the way. A true compact of the drilling industry, the N-45 is only eight feet wide. Highly portable, it can be moved as a single load.

The N-45 can be powered by any engine or twin combination developing a maximum of 450 horsepower. For easy access, high and low clutches are mounted outside the heavy steel plate drawworks housing.

TRANSMISSION

The transmission is a heavy duty chain type with two forward and one gear type reverse speed for rotary and hoist. The N-45 is one of the few torque converter rigs to incorporate a friction clutch transmission in its design. The mechanical drive design (N-45-M) multiplies transmission speeds through high and low drum clutches giving four forward and two reverse speeds to rotary and hoist.

COMPOUND

When two engines are used or a pump drive is specified, the N-45-M is furnished with a chain compound. Compound clutches permit use of one engine on drawworks and other on pump drive.

BRAKES

Full 327° wrap having 1" x 8" linings on 40" drums. Brake flanges are cooled by circulating water. Provision is made for installation of a 15" double hydromatic brake.

Get complete information on Brewster equipment now.
See your Brewster dealer or write or call Brewster.

SPECIFICATIONS BREWSTER N-45

Recommended Horsepower	450
Drum Brake Diameter x Width	40" x 8"
Drum Spool Diameter and Length	18" x 40"
Size of Brake Lining	1" x 8"
Net Braking Surface (Lining) Square Inches	1,728
High Speed Transmission Clutch (Twin Disc)	PO-218
Low Speed Transmission Clutch (Twin Disc)	PO-318
Drum Clutch Fawick Friction and Positive	28VC650
Transmission:	
Forward Speeds	2
Reverse Speeds	1
Rotary Clutch Size (Twin Disc)	PO-218
Size Main Skid Members	10 x 10 H
Approx. Overall Height	69½"
Approx. Width and Length of Skids	75" x 20'-0"
Approx. Wt. of Drawworks, (1-Engine) less Eng.	22,000 lbs.

Brewster MATCHED Drilling Equipment for the N-45 Drawworks includes the Model HT-100 Hook Block, the RSH-75 Rotary and the 4-SX Oil Sack Swivel.

BREWSTER N-45

ROTARY RIG DRAWWORKS

Torque Converter,
Fluid Coupling
or Mechanical Drive

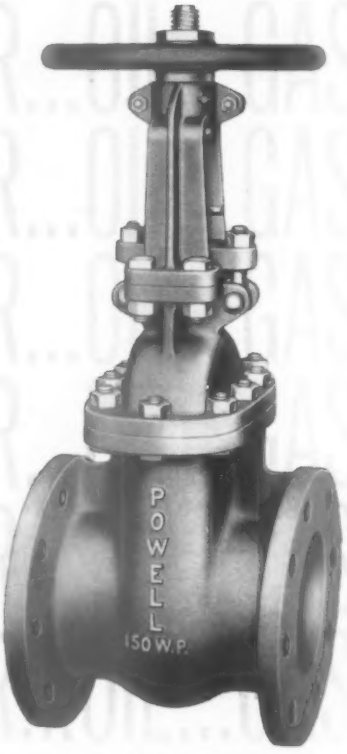
THE BREWSTER COMPANY, INC.
P. O. BOX 1095, SHREVEPORT, LOUISIANA
TELEPHONE 424-3254

PRODUCTS OF CREATIVE ENGINEERING

Iron Body Bronze Trimmed Gate Valve for 125 psi—Fig. 1793. Bolted yoke-bonnet, outside screw rising stem, solid wedge, bronze seats. Available with screwed ends and in all iron.

Integral Bonnet "Y" Valve—Figures 1314A (1500PSI), 25014A (2500PSI) — for high pressure steam, boiler feed water, bypass, instrument and throttling services. Furnished in steel and stainless steel with socket welding ends. Globe and angle valves also available.

Bronze Gate Valve for 200 psi—Fig. 375. Union bonnet, inside screw rising stem, interchangeable solid or split wedge, integral seats. Available with flanged ends.



Stainless Steel Gate Valve for 150 psi—Figs. 2453SG (Solid Wedge), 2453DG (Split Wedge). Bolted yoke-bonnet, outside screw rising stem, integral seats. Wedges are fully guided.

POWELL VALVES: FOR WATER...OIL...GAS...

You can depend on Powell Valves to cover practically every need in oil refineries, petrochemical plants and storage facilities. And Powell's nationwide stocking means even *more* for you...faster delivery, less down time and greater savings!

When you buy Powell, you buy dependable performance—the result of engineering skill, and experience. For further information, call your Powell Valve Distributor or write direct.

Iron Body Bronze Trimmed Swing Check Valve for 125 psi — Fig. 559. Bolted flanged cap, renewable bronze seat and disc. Screwed end and all iron valves are available.

Steel Gate Valve for 300 psi — Fig. 3003. Bolted yoke-bonnet, outside screw rising stem, solid wedge, screwed-in seat rings. End flanges have 1/16" raised face. Screwed end and welding ends can be furnished.

ASA 150-pound Carbon Steel Lubricated Plug Valve — Fig. 1563G. Bolted gland type, worm gear operated. Spur gearing can be furnished. Facing, drilling and dimensions conform to latest standards.

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Be sure and visit our Booth No. 133 at the 28th Exposition of Chemical Industries, New York Coliseum, Nov. 27-Dec. 1.

Refer to our catalog in Chemical Engineering Catalog

115th year of manufacturing industrial valves for the free world

POWELL DEPENDABLE VALVES

THE WM. POWELL COMPANY CINCINNATI 22, OHIO

MUD-SOL

Fastest, most efficient way to remove mud filter cake... increase well production!

Nothing cleans drilling mud and filter cake from a well like Mud-Sol. A patented well-treating solution, Mud-Sol quickly removes mud blocks to increase production... makes subsequent acidizing or fracturing treatments more effective... and promotes better bonding of cement in casing or squeeze-cementing operations. It is also ideal for removing mud which has entered into a pay formation... or for increasing the permeability of formations which are relatively insoluble in regular acid. Mud-Sol's *balanced* formula prevents the formation of pore-plugging gels, emulsions and water blocks... keeps undissolved solids dispersed and suspended until they can be flushed from the well. You'll be money ahead when you remove filter cake with Mud-Sol – available *only* from BJ Service.

For complete details, call your local BJ Service field station today.

New! COMPUFRAC electronically computes the best fracturing treatment for your well!

An advanced computer technique, COMPUFRAC solves for fracture areas at various volumes and injection rates for any number of frac fluids – does it in *seconds!* Outputs are based on calculated (not assumed) fracture widths, either vertical or horizontal. You know in advance the optimum volume and injection rate for the fluid best suited to *your* well. COMPUFRAC service available *now* at no extra cost to you. Free Technical Bulletin on request.

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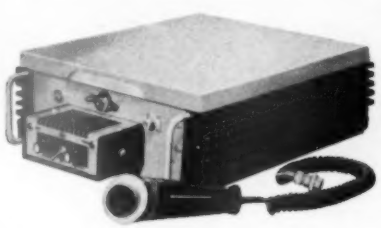
BJ B-W SERVICE

RCA "LD" 2-way radio has the guts to stand up to the toughest jobs!

There are rugged places where men, trucks and 2-way radios have to go, and each has to be a proven, reliable performer. In 2-way radio, this means quality must be built-in to take the gaff—quality such as only the leader in radio and electronics can offer—in the new RCA "LD" (Low battery Drain). Quality and price are combined in this dependable RCA equipment to give you the very best performance at the lowest cost. Use it on the roughest roads—Security Sealed Circuits are your assurance it can take it. Leave the radio on when your vehicle engine is turned off—battery drain is negligible—transistors are used in circuits where they have been proven to be most dependable.

It took experience and daring to bring you today's RCA 2-Way Radios. It meant discarding preconceived notions about circuits and redesigning with transistors in key places for reliability with economy. And it involved engineering a host of other advanced features to assure fine message intelligibility, and long component life at moderate cost.

Your RCA Communications Specialist will be glad to show you why the "LD", dollar for dollar, feature for feature, is today's greatest 2-way radio value. Or send coupon for further facts.



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The Most Trusted Name in Radio

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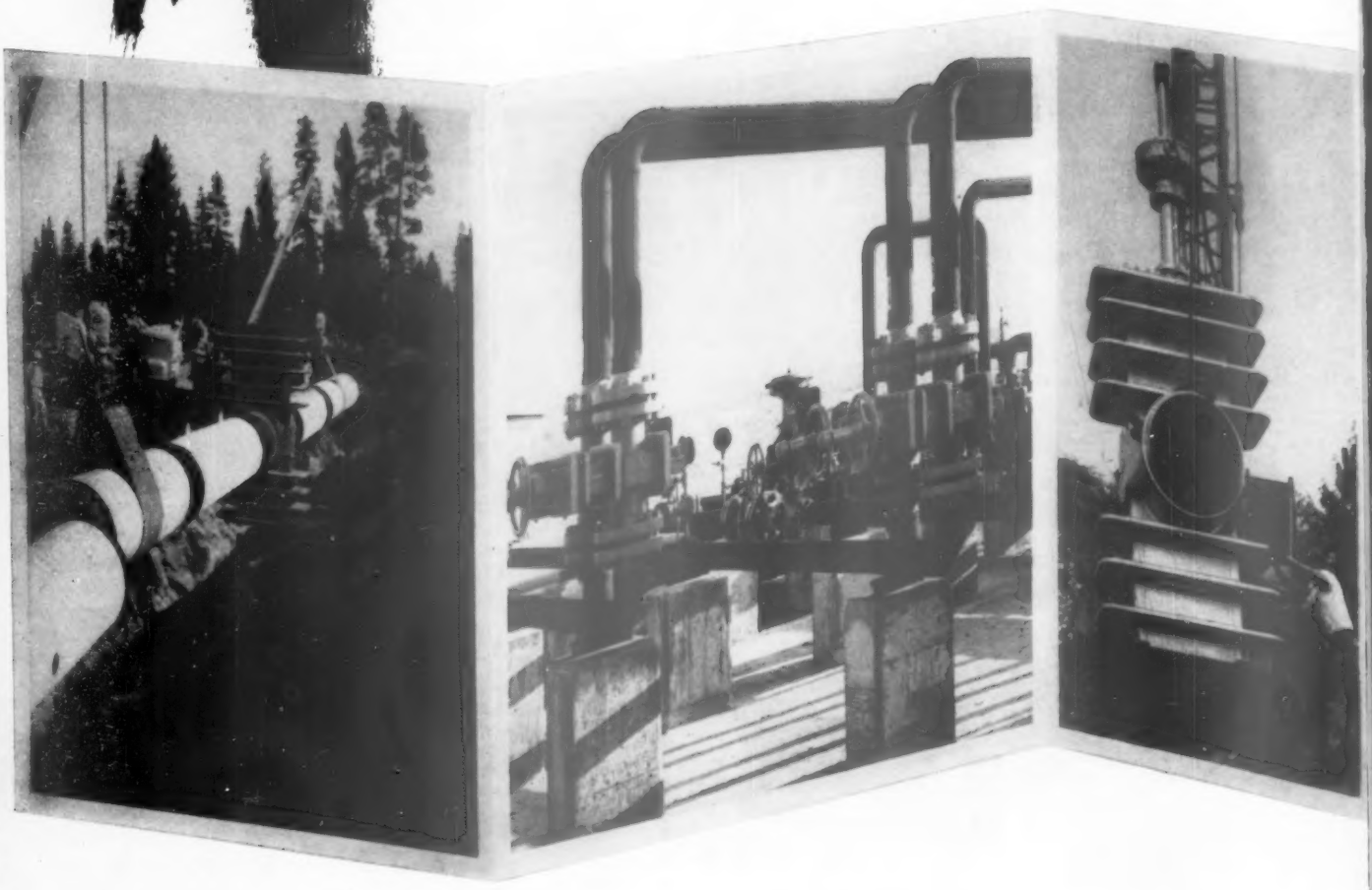
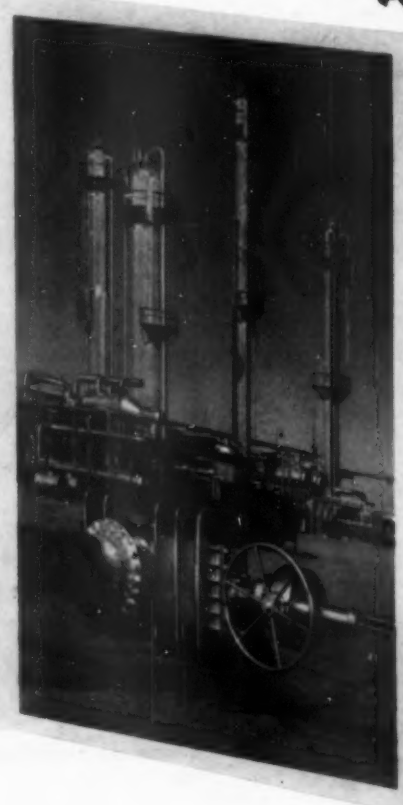
The "Profit-Minded"



AS YOUR ARM*

companies using proven Grove G-4 Seal-"O"-Ring® Valves



*We'll be glad to send you a copy!

The worth of a valve can often be measured by the companies it serves. And Grove Series G-4 pipeline valves have been performance-proved by hundreds of profit-minded transmission, distribution, crude and product pipeline companies! All over the world, the patented Seal-"O"-Ring design of Grove G-4 valves has been delivering dependable, positive, bubble-tight closing—without the expense and nuisance of periodic lubrication or adding of sealing compounds! Look around for the valves with the "hoop ribs." You'll be impressed with the broad acceptance of Grove Series G-4 gate valves in gas, crude and product service.

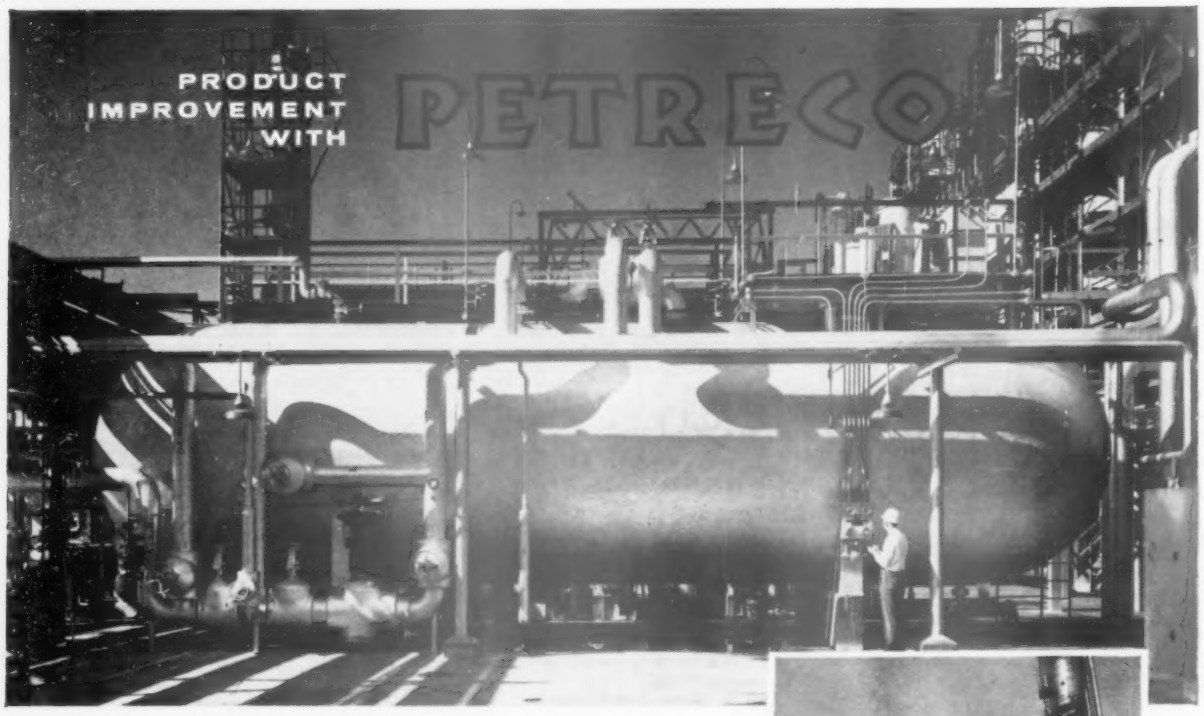
GROVE PIPELINE VALVES

GROVE VALVE AND REGULATOR COMPANY

a subsidiary of Walworth

6529 Hollis Street, Oakland 8, California

Offices throughout the U. S. and in Western Canada



Efficient Desalting is the first step toward Profitable Refining

Salt removal is now a routine operation in all modern refineries. With the need for effective desalting widely recognized, the main problem today is the selection of that equipment which will do the most efficient job at the least possible cost.

When you need new or additional desalting facilities, keep these points in mind:

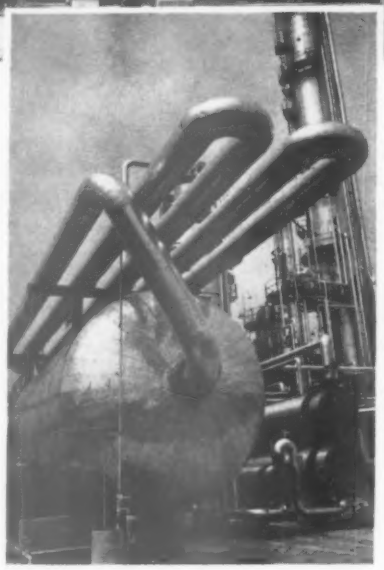
The first electric desalter was designed and installed by Petreco engineers.

This was nearly a quarter of a century ago. The subsequent years of solid, practical experience in solving desalting problems all over the world now enable Petreco desalting to remove salts and other impurities in the 98-100% range. The fraction of a cent per barrel desalting cost is saved many times over by the gains in refining efficiency resulting from a clean charging crude.

The first chemical desalter was designed and developed by Tretolite engineers.

Tretolite chemical formulations were the first ever to be used in desalting. Tretolite desalting units are the only exclusively chemical desalters ever to be sold and installed in the refining industry and are currently used to desalt a million and a half barrels per day. In fact, every important development in crude oil desalting has resulted from the Petrolite research, engineering and development program.

Because Petreco offers both types of desalters, you get an objective appraisal of the method best suited to your operation.



Operating records from installations such as these, around the world, prove that no other desalting equipment on the market can offer you comparable efficiency. And no other company can offer you Petreco's fund of desalting technology and experience.

YOU GET 98-100% SALT REMOVAL WITH PETRECO ELECTRIC OR TRETOLITE CHEMICAL DESALTING

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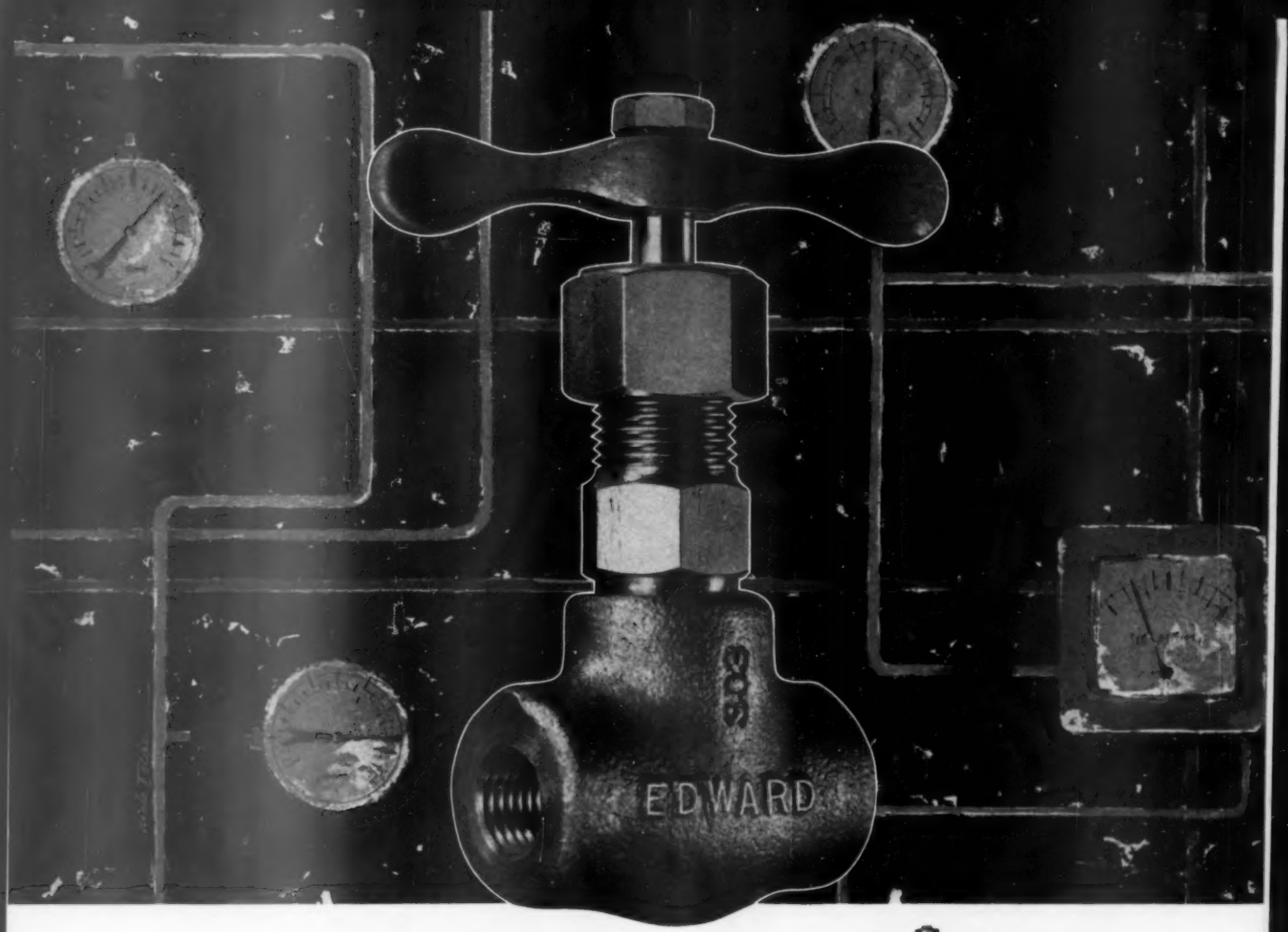
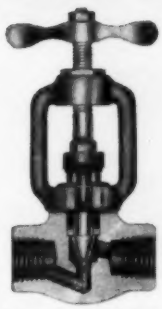
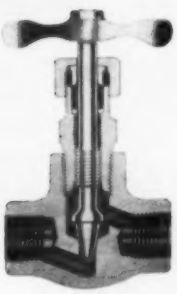


Edward Steel Gage and Instrument Valves provide dependable, finger-tip control

Edward gage and instrument valves will give you longer, more reliable service with less maintenance cost on pumps, separators, oil-field Christmas trees, and for meter, regulating, bypass, and dead-end lines. Edward gage valves are made of drop forged carbon steel or 18-8 stainless steel for sounder structure and greater strength than valve bodies machined from bar stock. Edward instrument valves have a carbon or 13% chromium stainless steel body. Carbon steel body has an integral cobalt-chromium-tungsten alloy steel seat that resists pitting and gives maximum resistance to corrosion and erosion. Choice of globe or angle body. For additional information, see your favorite distributor, or write to Edward Valves, Inc., 1212 West 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company.



Instrument Valve
Fig. 952 & 2952
6000 lb WOG

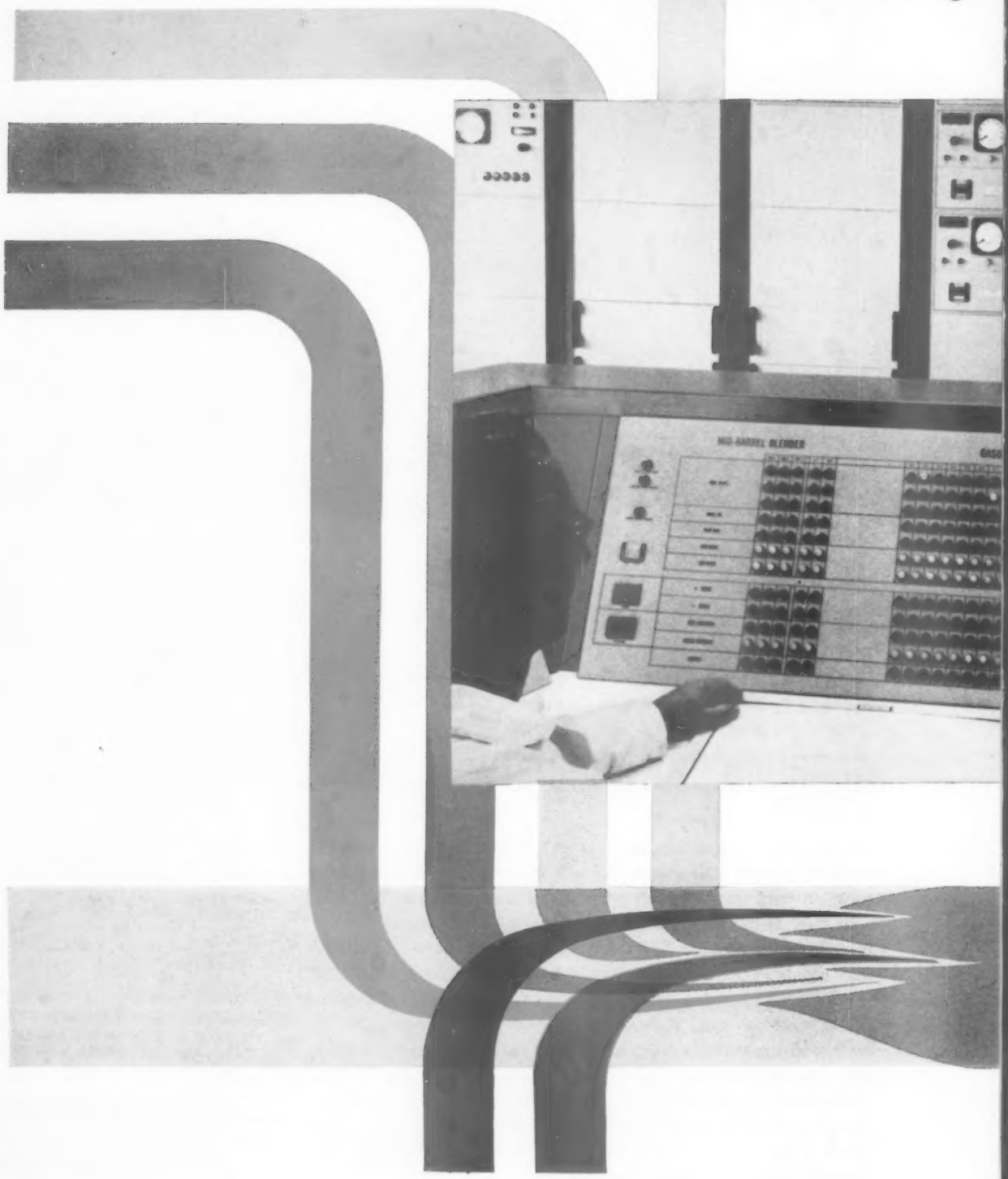


Gage Valve
Fig. 152 & 4152
4000 lb WOG

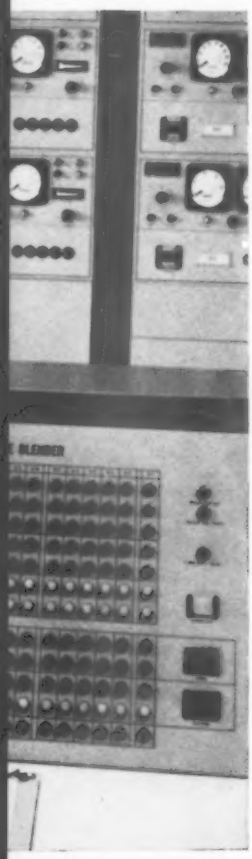
Contoured T-handle on both gage and instrument valves provides easy, finger-tip control. On gage valves, the bonnet and packing nut are EValized (exclusive Edward plating process) to minimize galling and corrosion. Instrument valves have EValized gland and gland bolt nuts, stainless steel gland bolts. Taper-threaded joint between bonnet and body of gage valves prevents bonnet from backing out of valve. Instrument valves are of bonnetless design. Semi-needle, integral stem-disk is made of EValloy 13% chromium or 18-8 alloy stainless steel, hardened for wear resistance.

EDWARD STEEL VALVES
another fine product by
ROCKWELL

NOW - from Foxboro - an advanced that virtually



continuous in-line blending system eliminates off-spec blends



At Union Oil's Los Angeles refinery the engineering techniques behind the Foxboro-Waugh Blending System already have been proven.

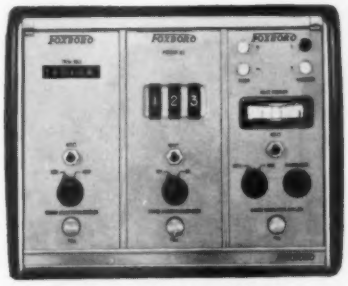
Foxboro-Waugh Blending System*, with digital control, provides precision blending accuracy... permits instant, remote-control blending changes

With acquisition of the Waugh Engineering Company, Foxboro now brings to the petroleum industry a new, high precision blending system that increases the efficiency of continuous in-line blending. It's the Foxboro-Waugh Blending System — with an overall accuracy that virtually eliminates off-spec products.

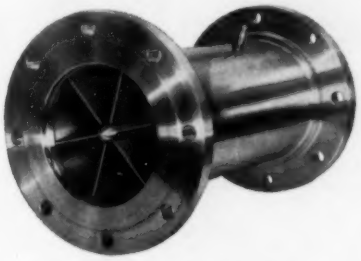
The Foxboro-Waugh Blending System lets you mix a wide variety of refined oil products — continuously, automatically, with precision accuracy — right in the pipeline!

With the Foxboro-Waugh System you change blends quickly — right from the control panel. No more batch mixing. No more waiting for blend tanks. No more time-consuming trips to the field to turn valves for a blend change. The system allows checking product quality without waiting for the end of the blend.

Find out how your plant can strip away thousands of dollars of tankage, reblending and other operating costs with the Foxboro-Waugh Blending System. Write for Bulletin 10-27. The Foxboro Company, 6011 Neponset Ave., Foxboro, Mass., or Waugh Engineering Division, 7740 Lemona Ave., Van Nuys, Calif.



Foxboro-Waugh solid-state Standardizer, Ratio Selector, and Digital Controller provide instant, dependable blending control.



Unique Waugh Turbine Flow Meter transmits digital signals with accuracy as low as ±0.25% and repeatability of ±0.10%.

*An electronic blending system developed jointly by Union Oil Company of California and Waugh Division of Foxboro.

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in research
for decreased
drilling costs
through
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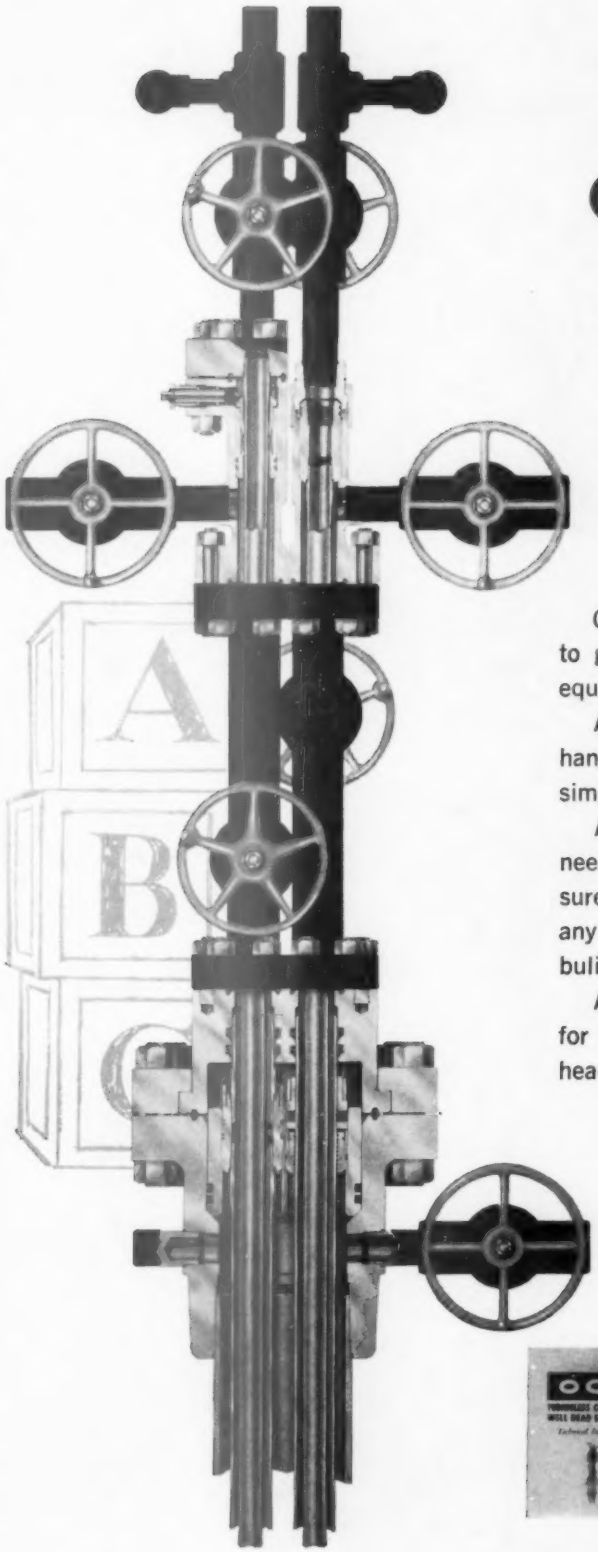

Tubingless Completions are simpler with O·C·T equipment

O·C·T tubingless completion equipment is designed to give you simplicity and flexibility that simplify your equipment problems.

A complete line of interchangeable slip and threaded hangers lets you suspend from one to eight tubing strings, simply by changing hangers.

A variety of casing heads for these hangers meets your needs for single or multiple completions, at working pressures up to 10,000 psi. Master Bushings allow assembling any desired multiple completion and permit running turbulizers, centralizers or other related downhole equipment.

A new type M (for macaroni) tubing head is supplied for hanging 1½-inch and smaller tubing strings. These heads can be furnished with either flanged or threaded connections on top and bottom. Crescent flanges, tri-flanges, and quadri-flanges are available.

If you want to use an economical tubingless completion on your next well, talk with your nearby O·C·T representative. He can show you the latest in tubingless completion equipment.

Write for the helpful free booklet, "O·C·T Tubingless Completion Well Head Equipment," which discusses requirements for tubingless completion equipment.

where progress is a daily practice

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OIL CENTER TOOL CO.

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Experience engineers your plant and puts it where you want it

The ideal objective in planning your process installation is to arrive at the most direct and economical route to your production and quality requirements.

If anything can bring you close to this ideal, it is experience . . . and this is what Foster Wheeler has to offer . . . unusually broad experience in process design, engineering, procurement, construction and plant start-up. The adaptability of this experience has been demonstrated by over 800 successful major installations in 41 nations.

FW engineers have established their ability to meet guarantees for quality, cost and production. In addition, they have found and developed hidden opportunities in many processes for still greater cost reduction and for improved performance. If you are considering a new process installation, it will profit you to discuss your requirements with Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, N.Y.

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Complete Mud Service

Baroid's mining, manufacturing, quality control, new-product research, warehousing, delivery and engineered application are integrated into a single chain of service.

Wherever you drill, Baroid has mud stocks nearby. Delivery is fast and accurate. You can secure all needed mud materials from a single source. Baroid's third-of-a-century in the mud business gives you the greatest depth of experience and breadth of service. Baroid's unified operation helps you keep rigs on schedule and operating costs at a minimum.

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BAROID

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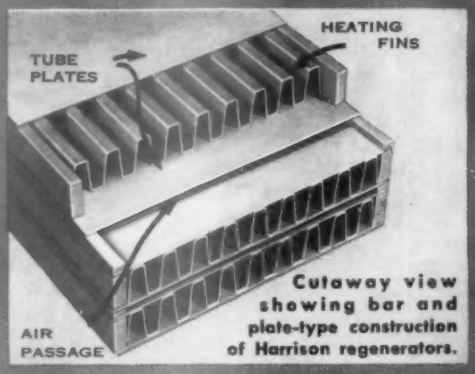
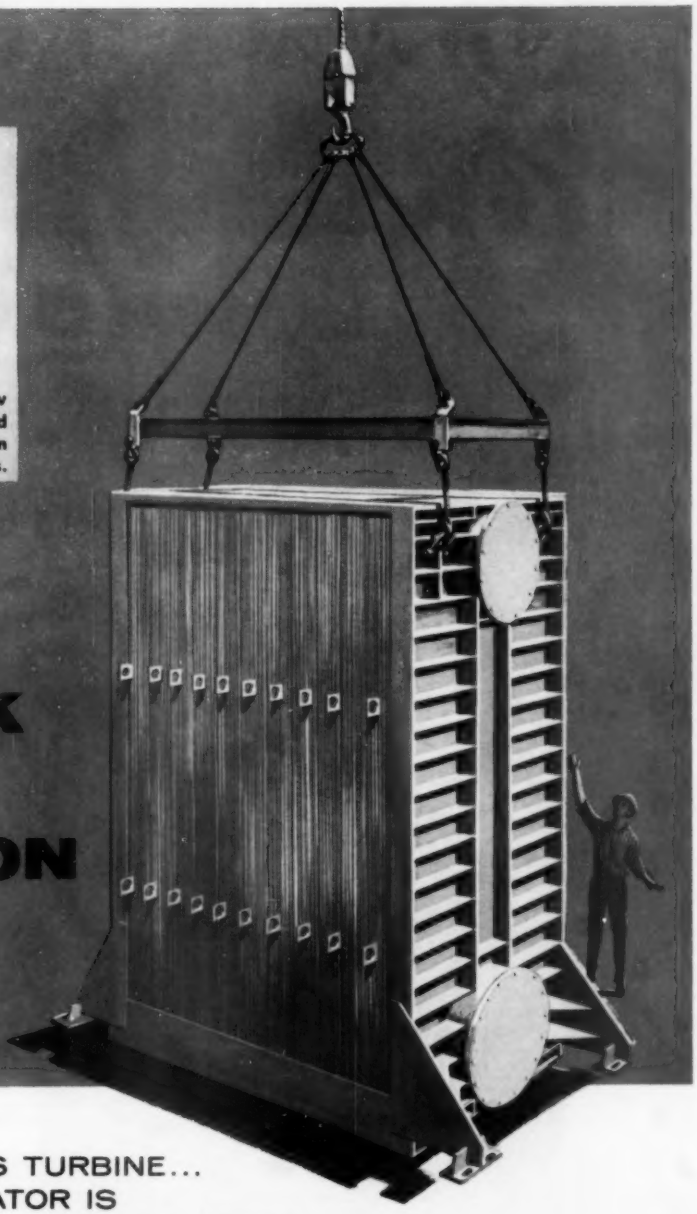


Cutaway view showing bar and plate-type construction of Harrison regenerators.

CHOPS FULL WEEK FROM INSTALLATION TIME!



WARM FRIEND OF THE GAS TURBINE... THIS HARRISON REGENERATOR IS COMPACT AND UNUSUALLY EASY TO ERECT!

"On-the-spot" experience proves this unusual design makes an important reduction in erection time and costs. Harrison regenerators require considerably less installation welding . . . conserve weight and space, too. They are designed for simpler, more convenient handling . . . save labor at every step of the installation. All these Harrison features permit you to cut a full week or more from normal erection time. For ease of installation and maintenance, for operational efficiency and reliability, you can depend on Harrison regenerators . . . designed and built to General Motors standards of quality and value.

Free For an informative 48-page brochure on the complete Harrison line . . . write to Department 902

GM HARRISON

TEMPERATURES MADE TO ORDER

AERO/SPACE, AUTOMOTIVE, MARINE AND INDUSTRIAL HEAT EXCHANGERS

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, NEW YORK

NEW * AUTOMATIC

...BRODIE APL*

*APL—The Important New Meter Break Thru ...HANDLES ALL NON-LUBRICATING LIQUIDS:

Sizes 3" to 24" ... Capacity to 20,000 BBLS per hour Pressure to 1,200 PSI.

EXCLUSIVE APL FEATURES:

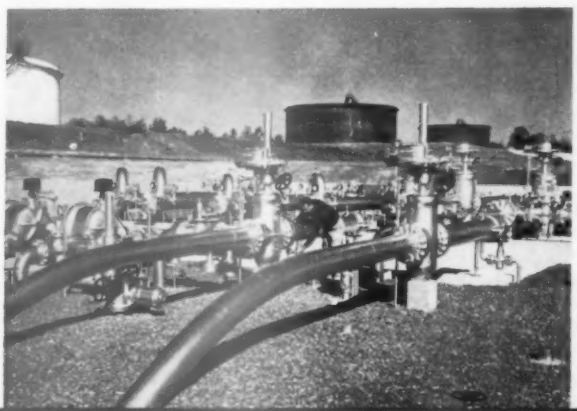
1. Handles non-lubricating liquids, such as butane, propane, isobutane, propylene, butylene, ethane, natural gasoline and other high vapor-pressure hydrocarbons.
2. Provides positive fully self-contained lubricating system.
3. Permits continuous operation of full rated capacity over long periods.
4. Minimum maintenance, wear and repair.
5. Pressure lubricated bearings and gears, completely isolated from flowing stream.
6. Independent oil reservoir supplies necessary lubricant to rotor bearings, timing gears and counter drive gearing, automatically by line pressure. A lubricant relief valve protects against excess pressure.
7. Pressure differential of sealed lubricant chambers prevents intrusion of abrasive foreign matter.

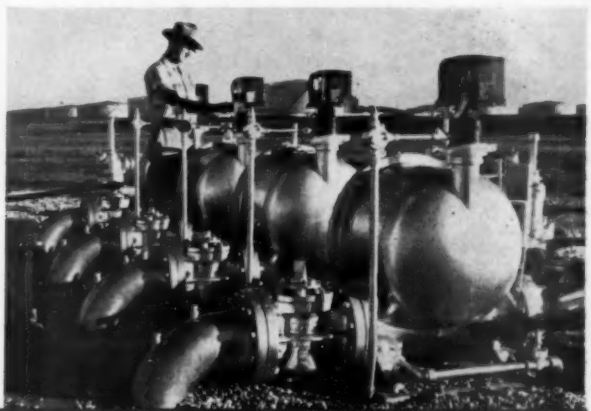
PRESSURE LUBRICATED
BiRotor METERS

BUTANE
PROPANE
ISOBUTANE
ETHANE
PROPYLENE
BUTYLENE
NATURAL GASOLINE—and other high vapor-pressure hydrocarbons!

Developed especially to handle **non-lubricating liquids** Brodie's exclusive new Automatic Pressure Lubricated **BiRotor** Meters overcome friction and wear — reducing maintenance and repair to a minimum. By an externally controlled system of positive lubrication, sealed off from the flow stream, Brodie APL **BiRotors** provide years of accurate, trouble-free service, even with silt-laden liquids. In continuous operation they can be operated at full-rated capacity, while in intermittent service the APL **BiRotor** operates at up to 35% above normal rating. Brodie **BiRotors** are never over-rated.

Brodie's continuing program of meter and valve research and development, backed by exhaustive operation testing, provide the solution to tomorrow's problems, today.





Write for Bulletin #689.

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

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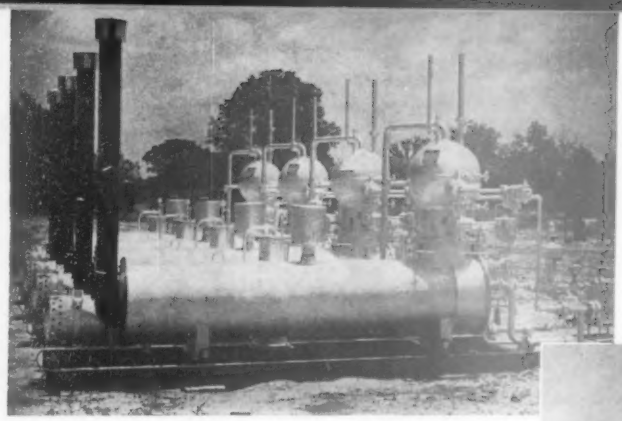
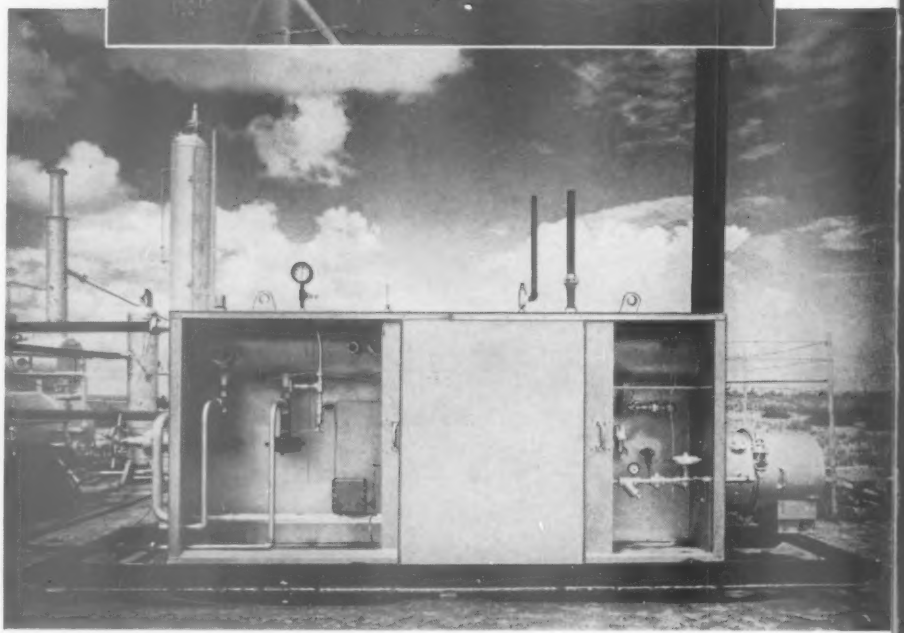
CHICAGO OFFICE: 801 Circle Ave., Forest Park, Ill.
LOS ANGELES 22, CALIF., 5401 Shaila Street



Free-O-Freez

PUTS ON AN OVERCOAT



Efficient, trouble-free production in all types of weather. This is what every operator wants from his wellhead production equipment.

A few years ago BS&B went a long way toward achieving this by introducing FREE-O-FREEZ . . . a line of compact, automatic skid-mounted production units that featured immersion of the water-oil section of the separator in a hot water bath and location of controls as close as possible to the heat source.

These units have proved themselves under severe weather conditions in the Panhandle, Permian Basin, and Four Corners area.

But there are still instances where production units need to be fully protected because of extreme cold, high moisture, or blowing dust that tend to foul up controls and valving.

So now you can get FREE-O-FREEZ with an "overcoat" . . . with all the time-tested features of other FREE-O-FREEZ equipment, of course.

Ask your BS&B Salesman about FREE-O-FREEZ, or write to Black, Sivalls & Bryson, Dept. 1-A11, Box 1714, Oklahoma City, Oklahoma.

DESIGN FEATURES

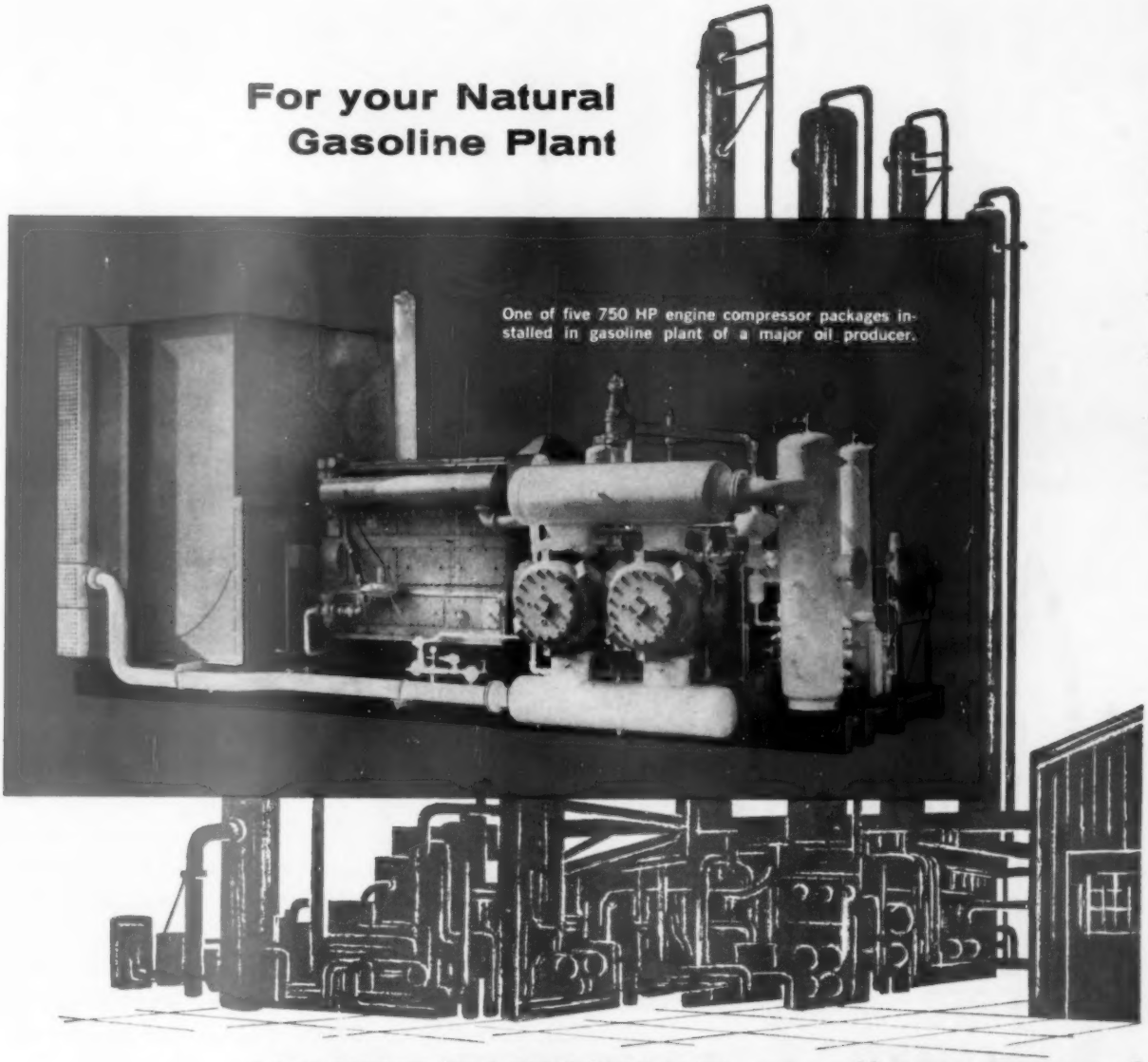
- *Controls, piping, and valves completely housed, protected against cold, dust and moisture.*
- *Skid-mounted, completely piped for immediate field hook-up.*
- *Removable firebox located at opposite end from tube bundle.*
- *Tube bundle easily removed for service.*
- *Heater capacities: 250,000 BTU/hr. and higher.*
- *Available with 2 or 3 phase separators.*

BS&B

BLACK, SIVALLS & BRYSON

OKLAHOMA CITY • KANSAS CITY • TULSA • EDMONTON • THE HAGUE

For your Natural Gasoline Plant



One of five 750 HP engine compressor packages installed in gasoline plant of a major oil producer.

WHITE/SUPERIOR medium speed ENGINE-COMPRESSOR SETS

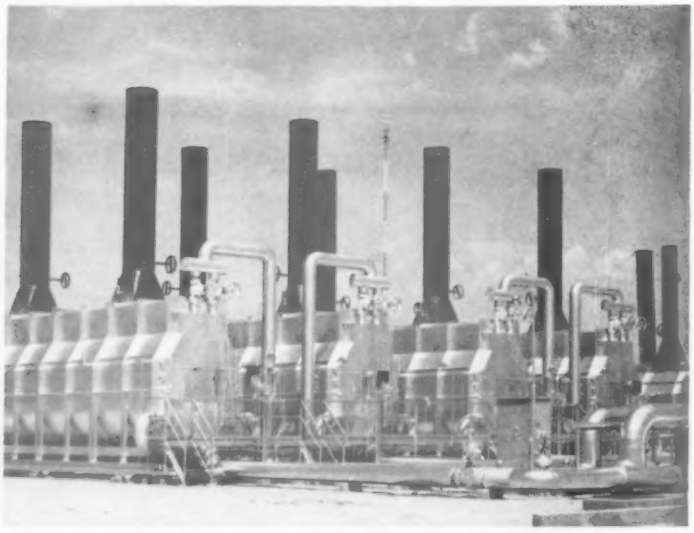
200-1000 BHP compressors are available for propane refrigeration and allied gas services such as compression of rich oil flash vapors, de-ethanizer overhead gas, etc. Typical is a 6-cylinder compressor utilizing 4 cylinders for 2-stage propane refrigeration and one cylinder each for the other services named above. Combinations range from 2-cylinder 200 HP units for small plants to multiple 1000 HP units for large plants.

Dependable, low-cost White/Superior compressors are designed for exact match with Superior *medium speed* gas engines. The 6" stroke balanced-opposed compressors direct-coupled to 9" and 10½" stroke engines provide optimum combinations of piston speed, horsepower and service life. Two, four and six-cylinder models are available completely packaged; block mounted or skidded; gas, diesel, dual fuel engines or electric motor drives. For engineering assistance pertaining to your specific application or additional data on existing installations, contact your nearby White representative or write to White Diesel Engine Division, Springfield, Ohio.

White DIESEL | Superior ENGINES

White Diesel

ENGINES / COMPRESSORS



100,000 to 200,000,000 BTU

PETROCHEM VERTICAL AND HORIZONTAL DIRECT FIRED HEATERS

For the petroleum, chemical and petrochemical industries, Yuba now offers the most complete series of direct-fired heaters available. From 100,000 to 200,000,000 BTU per hour – from -200° to +2,000° F – Petrochem Vertical and Horizontal Heaters can be built in every size and type for every use in any location!

Yuba Heaters are available from the most simple horizontal design to the famous Petrochem vertical with optional reradiation cones for even heat distribution and maximum efficiency.

Working closely with both customer and prime contractor, Yuba can provide single piece, shop-assembled horizontal heaters *to 30,000,000 BTU.* Other heaters up to 50,000,000 BTU can be provided in two sections. For field installations of larger heaters, Yuba can provide well-trained supervisory personnel when desired. Get the complete story on Petrochem direct-fired heaters from Yuba – your largest single, fully-integrated source of supply.

Other Yuba Products For The Petroleum, Chemical and Petrochemical Industries – Adsco Expansion Joints, Transaire Air-Cooled Heat Exchangers, Shell and Tube Heat Exchangers, Southwest Floating Roof Tanks, Cone Roof Tanks, Pressure Vessels, Field Erection, Columns and Towers, Process Condensers, Custom Fabrication.

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YUBA HEAT TRANSFER CORPORATION
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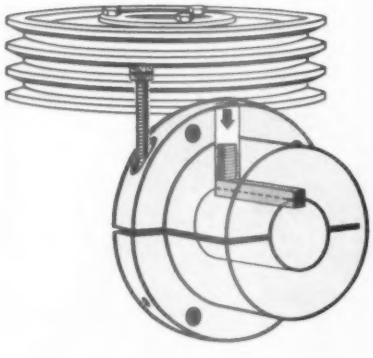
"AND THEN THE KEY CAME LOOSE..."



"Well, the key broke a window—it could have killed someone. A shaft was scored . . . the loss of drive power resulted in a loss of material . . . over $1,000 . . . we had to postpone deliveries 4 days." Frankly, this plant manager had it rough . . . though it could have been a lot worse, too. But he could have avoided the trouble completely by using Worthington sheaves that have the Two Golden Screws.

The Golden Clamp Screw at the left is an exclusive Worthington feature that locates and locks the hub securely on the shaft, permitting you to tighten the set screw without distorting the hub. And note that the two-piece hub-and-rim design simplifies installation. You install one piece at a time—or change sheaves without disturbing the hub or affecting the alignment.

The Golden Screw on the right is the set screw that turns down to lock the key securely in place. It prevents potentially damaging key drift. There's no extra cost for the set screw but it is worth its weight in gold for the safety it provides.

These Worthington hubs are standard in three major Worthington drive systems: the new, money-saving, more compact Multi-Wedge Drive; the standard Multi-V Drive and the Positive Drive. Ask for one or more of the "how-to-figure-it" design manuals shown here. Your local Worthington distributor stocks these products. He's listed in the Yellow Pages. Or write Worthington Corporation, Section 79-42, Oil City, Pennsylvania.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT.

SPECIAL REPORT TO MANAGEMENT

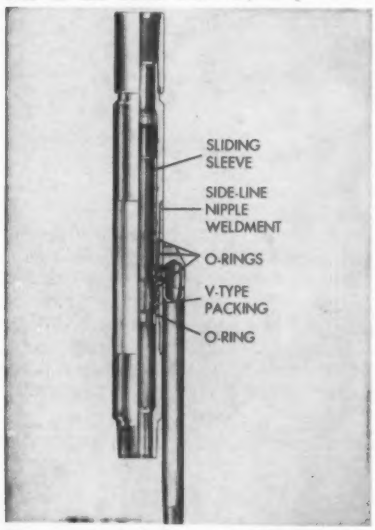
OTIS PRODUCTION NEWS

Volume II, Number 2 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*

New Otis Cross-Over Tool Solves Zone Feeding Problem In Single String Dual Completions

Sliding Side-Door® With Special Weldment Provides Complete Zone Isolation With Cross-Over Chokes Out of Well

CORPUS CHRISTI — Another downhole completion and production problem has been solved by Otis Engineering Corporation with the development of a new type of cross-over tool. The new tool is essentially a Type A Otis Sliding Side-Door to which has been added a special one-inch pipe weldment on one side of the outer mandrel, in place of



the usual slotted ports. The tool is designed to be made up in the tubing with a short tubing sub and Type S Otis Landing Nipple above it and a tubing sub and Ported Landing Nipple below it, and then set in a dual or by-pass type packer. When installed with a Type SS Otis Plug Choke set in the ported nipple, the sleeve may be opened to permit production from the upper zone to be brought into the tubing through the one-inch pipe weldment while flow from the lower zone is directed into the annulus.

See schematic well diagram — right

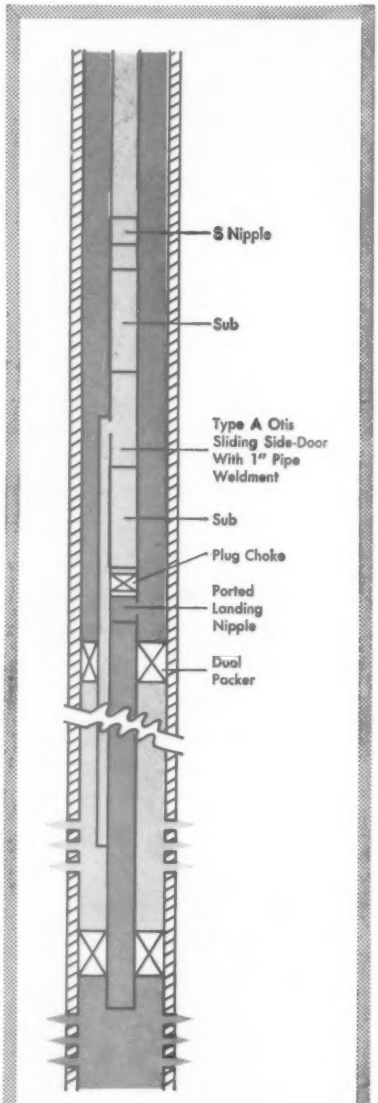
If desired, a straight flow choke may be landed in the assembly to permit production of the lower zone through the tubing while flow from the upper zone is produced through the annulus.

This new Otis Sliding Side-Door Cross-Over was developed at the request of a progressive Texas-based producing company which had experienced extended periods of lost production from the low pressure zones in its single string dual completions after changing a cross-over choke in conventional cross-over equipment, or when a choke had been out of the well for a short period of time for various types of wire line work. This loss of production proved to be the result of the high-pressure zone feeding the low-pressure zone.

According to the company, the new Otis Sliding Side-Door Cross-Over not only proved effective in solving its zone feeding problems, but it has also eliminated the need of having a pump truck on location to equalize pressure across the two zones — as was frequently necessary before the choke could be removed from conventional cross-over equipment. The company also reports it has successfully fractured the upper zone of a number of its wells through the one-inch pipe without damaging the tool.

The Type A Otis Sliding Side-Door, from which this new type of cross-over was derived, is a circulating and production tool which is used downhole to provide selective communication between the tubing and the annulus. The tool has a ported sleeve which is designed to be moved up or down within a ported mandrel. The sleeve may be shifted by one of two ways: 1) by standard wire line methods, or 2) by pumping down an expendable shifting tool. V-type packing and O-rings are used to provide a positive seal between the sleeve and the mandrel when the sleeve is closed.

The new Otis Sliding Side-Door Cross-Over is another example of the ingenuity of Otis' well completion specialists in the field and its engineering department in Dallas. Literally thousands of production problems of this nature have been solved by Otis over the past 32 years. For more information on the new Otis Sliding Side-Door Cross-Over, or for help with any specific production or completion problem, call the Otis office nearest you or write Otis, Dept. 2-W, Box 35206, Dallas 35, Texas. You will find your Otis specialist ready to help you — anxious to serve you.



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OTIS

Engineering Corporation

General Offices:

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YOU Asked for it...

and now it's here!

The New
COOPER TC-32
for Well Servicing to 6,000 ft. of 2½" Tubing

HERE ARE ONLY A FEW OF ITS MANY FEATURES:

- Cooper designed and built from the ground up especially for well service — single or double drum models.
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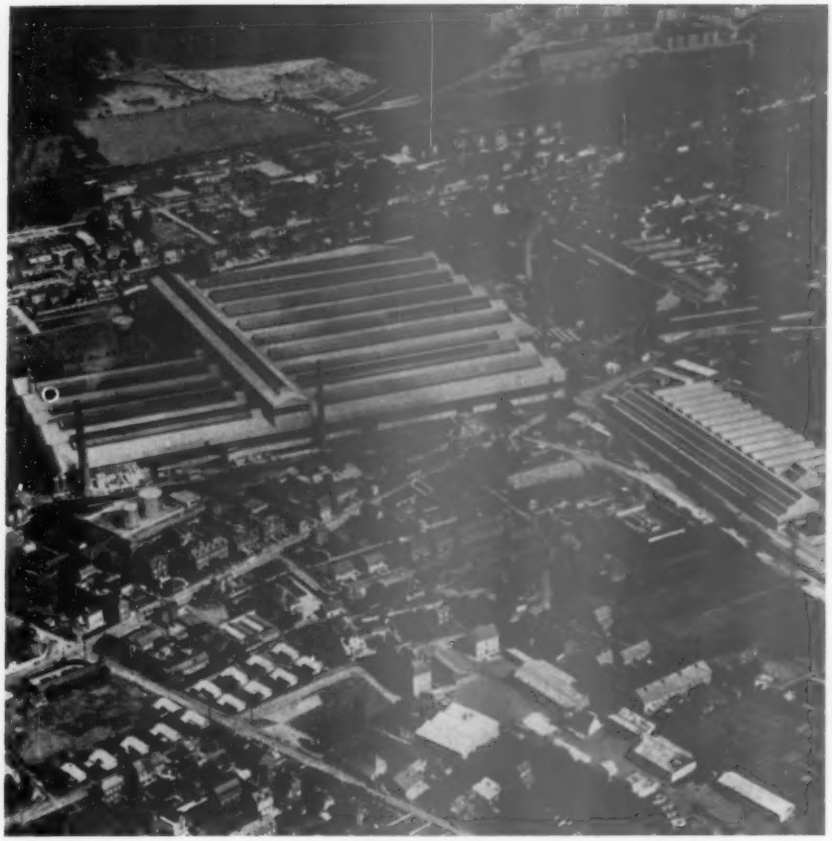


New French steel pipe mill

—High quality products to meet American specifications.

—Shorter hauls to open new markets.

Europe's newest factory for making seamless pipe is based on U. S. methods. It went into production in February in Déville, a suburb of Rouen, the 4th largest port in France, 60 miles inland on the Seine river. The vast modern mill is part of the SIDELOR company, which is an important division of PONT-A-MOUSSON, a major world-wide holding company in the iron and coal mining, sewage pipe systems, steel and steel pipe industries. PONT-A-MOUSSON has an annual capacity of 5 million tons of steel.

PONT-A-MOUSSON offers a full range of pipeline products and pipe-laying services. In addition to its plant at Deville it also controls the Belleville plant in eastern France. This plant produces large diameter welded steel pipe.

PONT-A-MOUSSON also controls the Differdange plant in Luxembourg, manufacturing small and average diameter steel pipe and controls a number of pipeline construction companies with a capital equipment investment of $10 million. Another subsidiary, the Ludwigshafen plant in Germany, manufactures oil-pumps.

All these plants are new. They have enabled PONT-A-MOUSSON to play

Advertisement

follows U.S. model

a key-role in the oil and gas development at Lacq and in the Sahara. The firm is building the South European pipeline from Marseilles to Karlsruhe.

The new mill is on the site of an older plant, but covers ten times the area. It took 2½ years to complete at the cost of 150 million new Francs ($30 million).

Production methods and quality control are supervised by F. W. BREMMER, previously with National Supply Company and now an independent consulting engineer. According to BREMMER, "This mill has the same facilities for the production of highest grade pipe as the best in the United States or Europe. By profiting from the experience gained by American mills—the Deville mill was built on U. S. lines—we're sure to match production capacity and quality while keeping costs low."

Jean CARMENT, Managing Director of the plant, points out that much of the equipment was either imported from the U. S. or constructed in Europe under American license. Equipment bought in the U. S. totalled $5 million, and an additional $2.5 million was spent for equipment made in France under American license.

The giant plug-rolling mill, installed by the U. S. firm, Aetna-Standard, is almost entirely automatic. It produces a length of pipe every 30 seconds. Management believes this is the best tool available for this operation.

The rotary hearth furnace, which duplicates an American model, was built by Stein & Roubaix. Using 1.5 tons of fuel oil per hour, it heats the steel to 2,320 °F., and also delivers a molten billet every 30 seconds.

Red-hot billets move swiftly through six precisely-timed, almost automatic operations: Centering, piercing, two phases of automatic plug-rolling, reeling and sizing and reducing. The pipe is then cut to length and goes through hydrostatic tests to a maximum pressure of 13,000 PSI.

Advertisement

The mill has units for threading, coupling and precision cold draw. Special operations such as end-upsetting, heat-treating, quenching and tempering are performed on the spot.

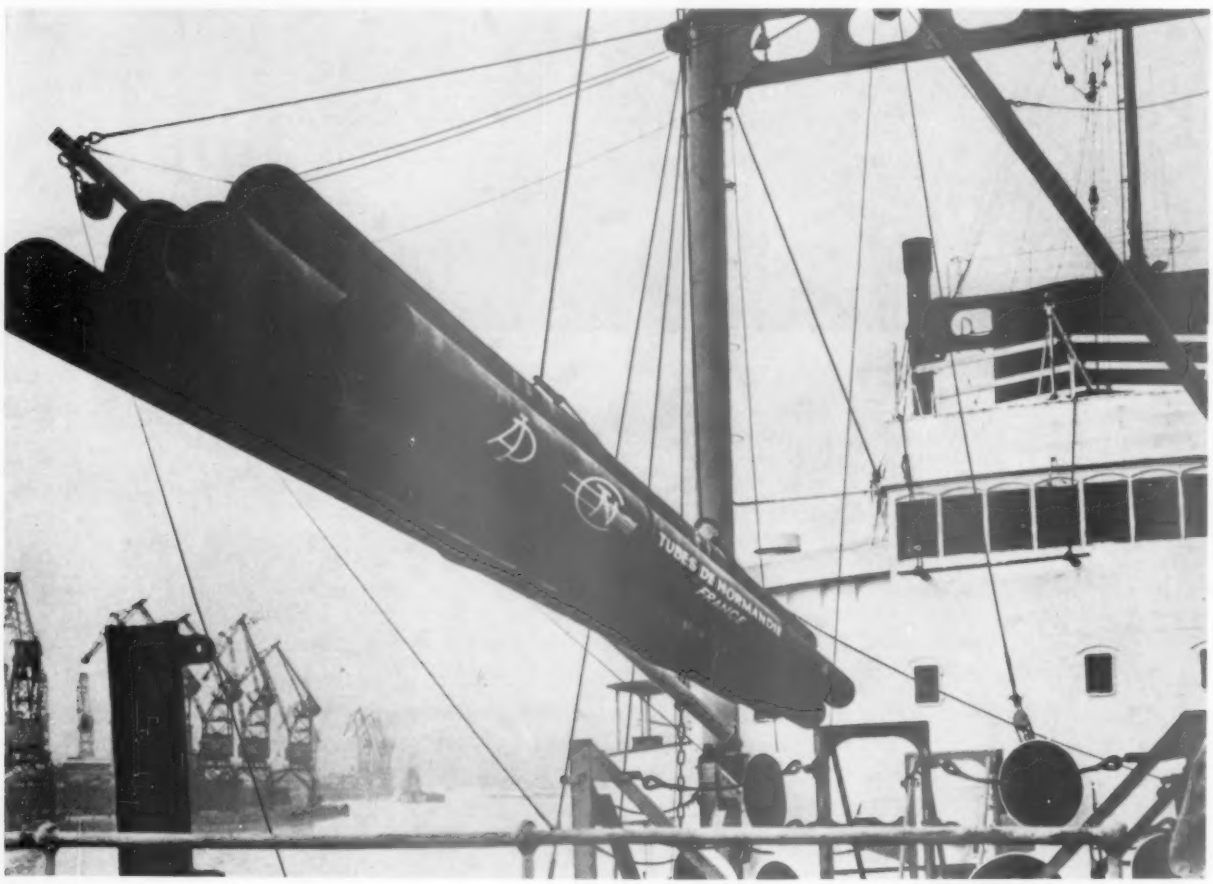
Production at the Deville mill was planned to serve the oil industry. The factory can manufacture any size of pipe between ⅓ in. to 10¾ in. in every possible grade of steel.

BREMMER says that, "The mill is capable of producing high quality products to meet all American or European specifications. We are able to make pipe of low alloys, and soon we'll turn out P. 110, the highest grade in A.P.I. standards. We've already made some special high quality pipe for experiments on the sub-Mediterranean pipeline."

René ANGOT, Commercial Director, believes the market situation extremely promising: "The Common Market, the Sahara and the Middle East are all within our reach. We're now exporting to many countries, including the Americas. With capacity much bigger than domestic needs, we look to export business to absorb a minimum of 50% of production."

French oil development got underway seriously after World War II and the tempo continues to increase. Domestic resources are small, covering only 10% of consumption. But the Sahara has stimulated a tremendous effort. Exploration is active in France as well as the Sahara and in other African nations. French enterprises, private or wholly or in part state-owned, and often with foreign concerns, are active in the Franc Zone (France, North Africa and Black Africa) and in Spain, Greece, Iran and Libya.

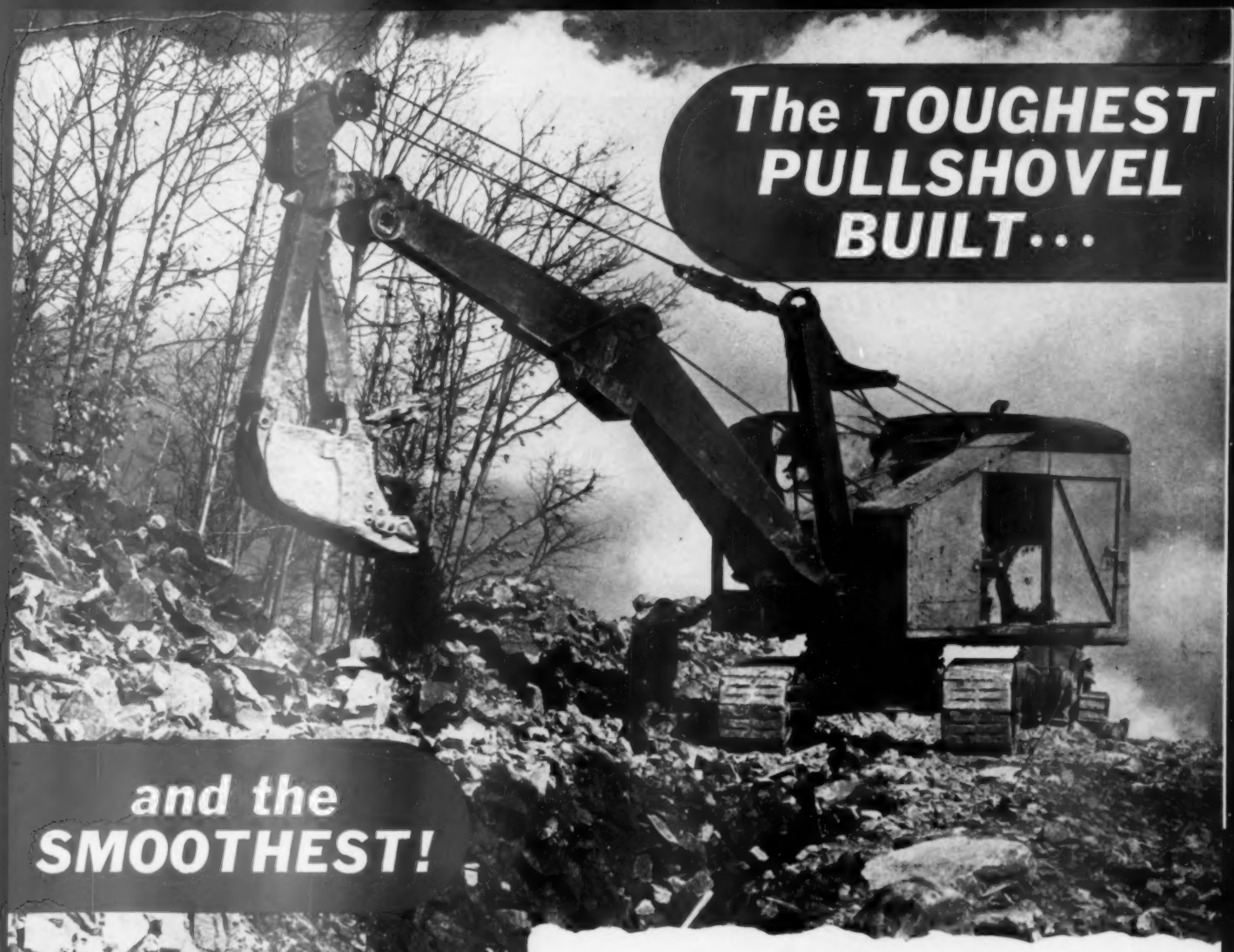
This surge of oil activity is the key to the future markets for the operation at Deville, with shorter hauls to North Africa and the Middle East and with competitive or better prices in the Western Hemisphere. Management is confident that today it is in a good position to win the bigger markets of tomorrow.



PONT-A-MOUSSON

MAIN OFFICES: PARIS: 24, rue de Prony (17e) • NEW YORK: Pontex Pipe Corp., Suite 1317, 116 John Street, New York 38, N. Y. • SAO PAULO: Rua Marconi 131 (7° andar) • MEXICO: Apartado 1014 Monterrey 29 • BUENOS AIRES: Calle Perú 263 7° Piso • BEYROUTH: P.O.B. 3359 • BANGKOK: P.O.B. 280.

Adv.



The TOUGHEST PULLSHOVEL BUILT...

and the SMOOTHEST!

PIPE LINE work calls for the best in equipment. You are never sure every foot of the way, exactly what you are going to hit. Water crossings often make rough going. Road crossings must be handled rapidly. Rock digging calls for real digging ability.

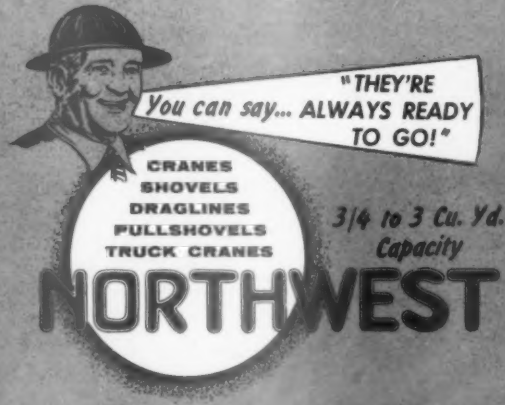
Northwest Pullshovels are built for depth, reach, and ability in tough digging. Pictured is a Model 25, ¾ yard Northwest, the workhorse of the pipe lines in a tough rock cut. It will bottom out at 17 feet with an 8 foot floor and gives a maximum reach of 31 feet 6 inches.

Here is the power and the weight to handle hard, heavy, digging. No auxiliary equipment is needed to hold a Northwest Pullshovel dipper down in the cut properly.

This is the kind of a job that brings out the value of the Northwest Feather-Touch Clutch Control. The Feather-Touch Clutch Control brings greater ease to operation. It gives the true "feel" of the load. There is no substitute for the feel of the load in probing out a buried ledge of rock, "feeling" for utilities or working around men.

Large Swing Clutches increase the accuracy in spotting loads and digging. All Northwest Swing Clutches are Uniform Pressure Swing Clutches. They are smooth in action, positively controlled. They make possible the clean trimming of the sides of the trench or the swift accurate spotting of the dipper over the hauling units.

These are just a part of the many Northwest advantages that get the job done—just a few of the things that save time and make money. There is nothing finer in a Pullshovel.



NORTHWEST ENGINEERING COMPANY
1513 Field Bldg., 135 South LaSalle Street, Chicago 3, Illinois

SAFE *floodlights*

for any explosion-prone area

These incandescent floodlights are explosion-proof and weather-proof . . . ideal for lighting hazardous areas such as this.

***ADDR-12.** Dust-ignition-proof floodlight. On aluminum dolly to fit over 33-inch manhole.

****RCDE-8.** Explosion-proof incandescent floodlight. Prisms treated to eliminate glare.

*****EVH.** Explosion-proof hand-lamp. Rain-tight, weather-resistant and easy to re-lamp.

What's your illuminating problem?

- Perhaps your problem is dust-ignition-proof floodlighting for dry, dusty, hazardous areas.*
- Possibly you're interested in explosion-proof incandescent floodlights for flush ceiling mounting — something that might be suitable for use in a process control room.**
- Maybe you're looking for rugged, explosion-proof hand lamps — for safe lighting of interiors of large fuel tanks during cleaning or painting operations.***

Whenever and wherever explosion-proof illumination is needed — whether in fluorescent, mercury vapor or incandescent lamps — Crouse-Hinds has a unit to fit your application need.

Check Catalog 320 for floodlights and Catalog 3000 for hand lamps. Or, see your Crouse-Hinds Distributor.

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The superiority of Tube-Kote coatings is no accident. Tube-Kote, Inc. is the pioneer in the field of protective coatings for oil field tubular goods. Almost a quarter century of experience has taught Tube-Kote chemists and technicians to take every precaution for maximum quality.
From the time your tubing is cleaned in preparation for coating, until it is inspected with Tube-Kote's remarkable automatic wet sponge holiday detector, every step is taken to insure you the finest protection for your investment.
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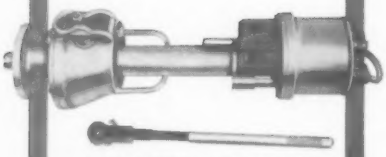
■ Assure long, trouble-free operation with a minimum of maintenance by installing dependable Mueller products in all of your water systems.

For more than a century, Mueller Co. has been a leading manufacturer of quality products for the water works industry. Many of these products have been adopted as standards of the water works industry.

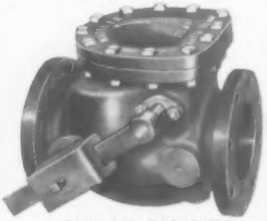
Today, Mueller Co. offers a full line of *proven* products for use in any type of water system. Just a few of these items are shown. Write for complete information. Ask about Mueller products for fire protection systems, too.

Mueller Co. also makes a complete line of No-Blo® Products and Equipment for the petroleum and gas distribution industries.



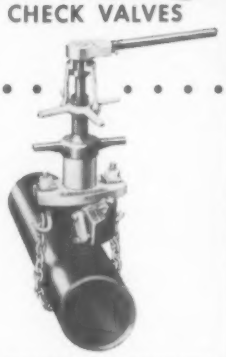
DRILLING MACHINES

GATE VALVES

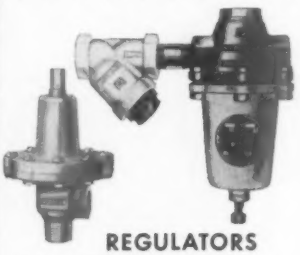


CHECK VALVES

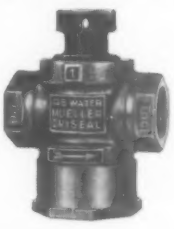
TAPPING SLEEVES AND VALVES



TAPPING MACHINES

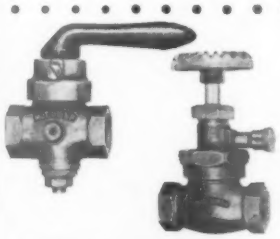


REGULATORS AND RELIEF VALVES



BRASS STOPS

SERVICE CLAMPS



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MUELLER CO.

DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles
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MARK OF ASSURANCE IN WATER FLOOD PUMPS

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gives you the best protection at the lowest cost...

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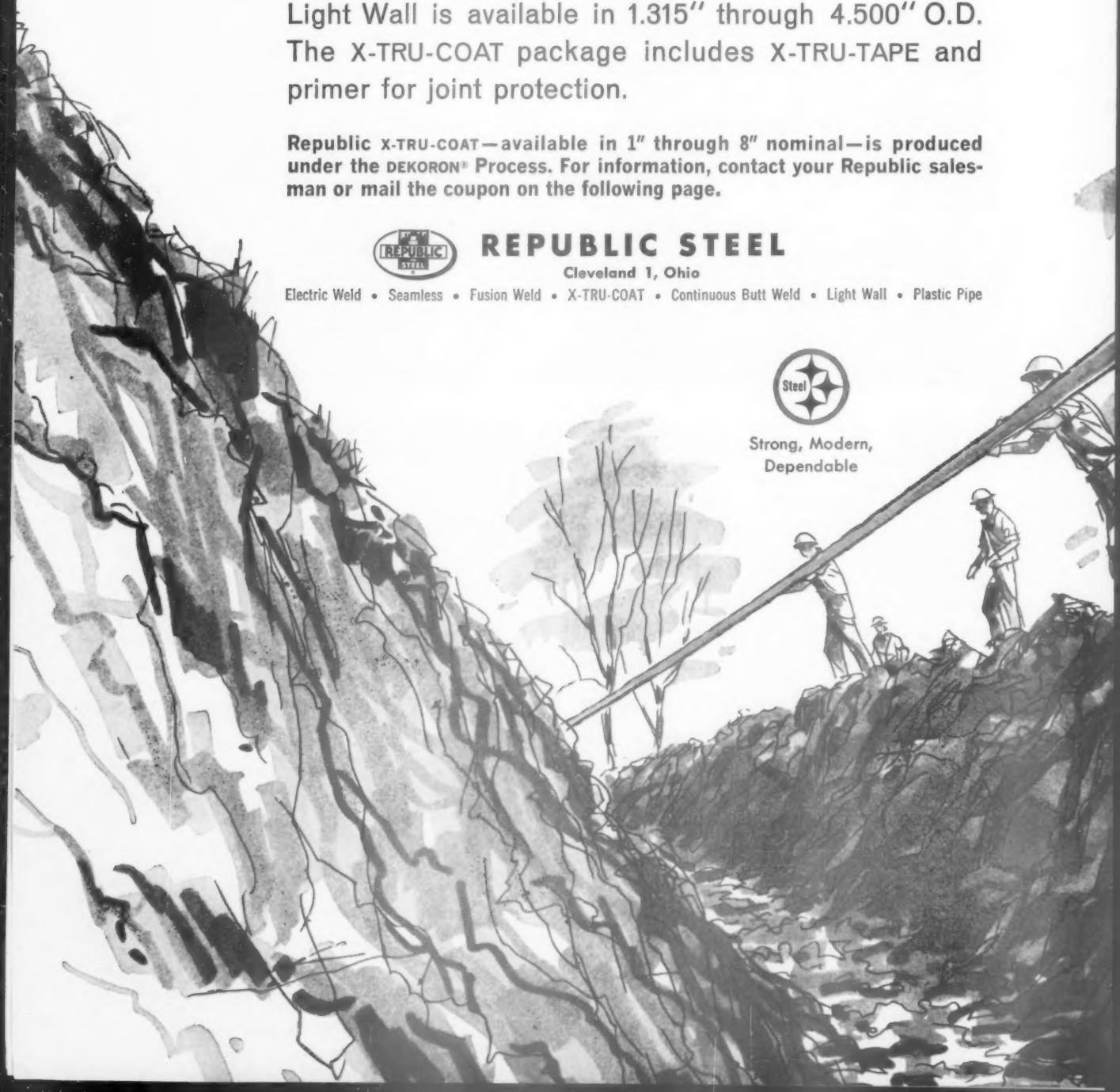
Cleveland 1, Ohio

Electric Weld • Seamless • Fusion Weld • X-TRU-COAT • Continuous Butt Weld • Light Wall • Plastic Pipe



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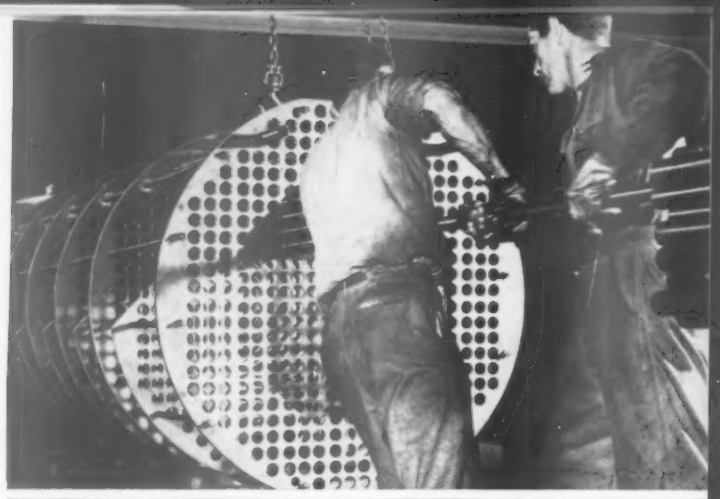
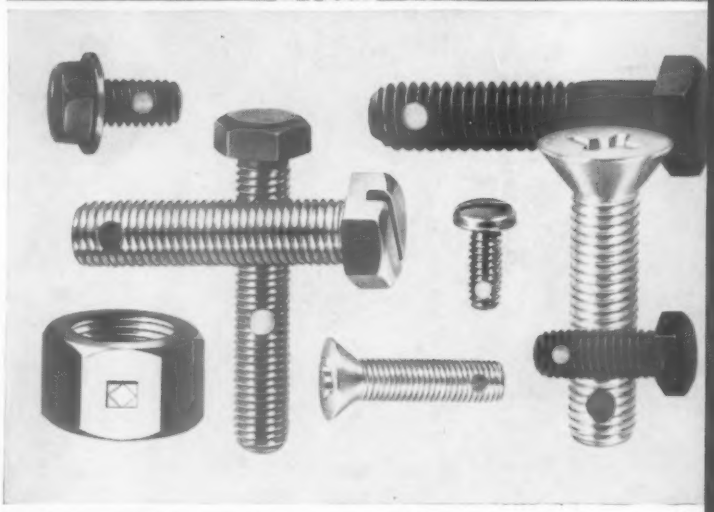
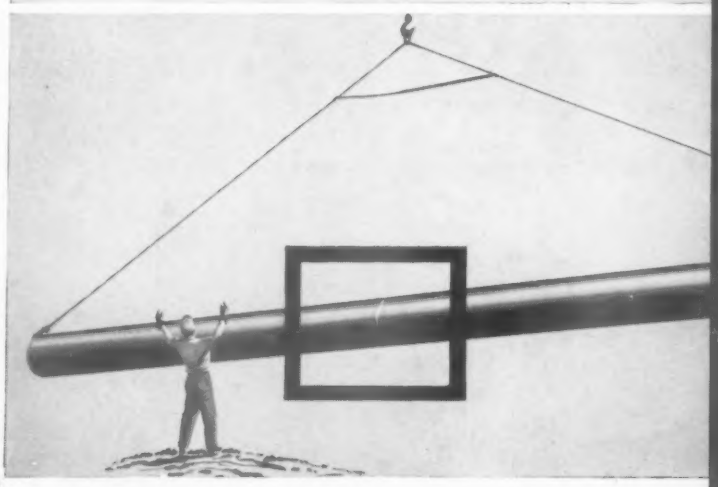


HIGHEST QUALITY FLAT ROLLED STEEL is precision formed and welded (without the addition of foreign metal) to produce Republic ELECTRUNITE® Heat Exchanger Tubing. For critical applications, Republic's FARROWTEST® nondestructive testing is offered at no extra cost as an alternate to other less positive tests. FARROWTEST is an electronic method of searching out and rejecting defects in carbon or stainless steel tubing. Mail coupon for data.



SPECIAL NYLON INSERTS in Republic NYLOK® Bolts and Nuts assure permanent lateral thrust against opposite mating threads. This single unit answer to vibration problems eliminates the need for cotter pins, set screws, lock washers, or wiring of heads. NYLOK Fasteners resist age, moisture, alcohols, esters, ketones, refrigerant gases, boiling 40% caustic soda, common solvents, and temperatures ranging from −70° to +250°F. Return coupon for details.



STANDARD LENGTHS OF FUSION WELD ARE JOINED by submerged arc welding to produce Republic SUPER-SPAN in 60-foot lengths. Only 88 of these joints are required to make up a full mile of pipeline. Straight and strong, Republic SUPER-SPAN is famous for constant circumference, uniform wall thickness, and accurate size. This pipe lines up quickly and easily for precision field welding. Available in 24″ through 30″ O.D. Send for information.

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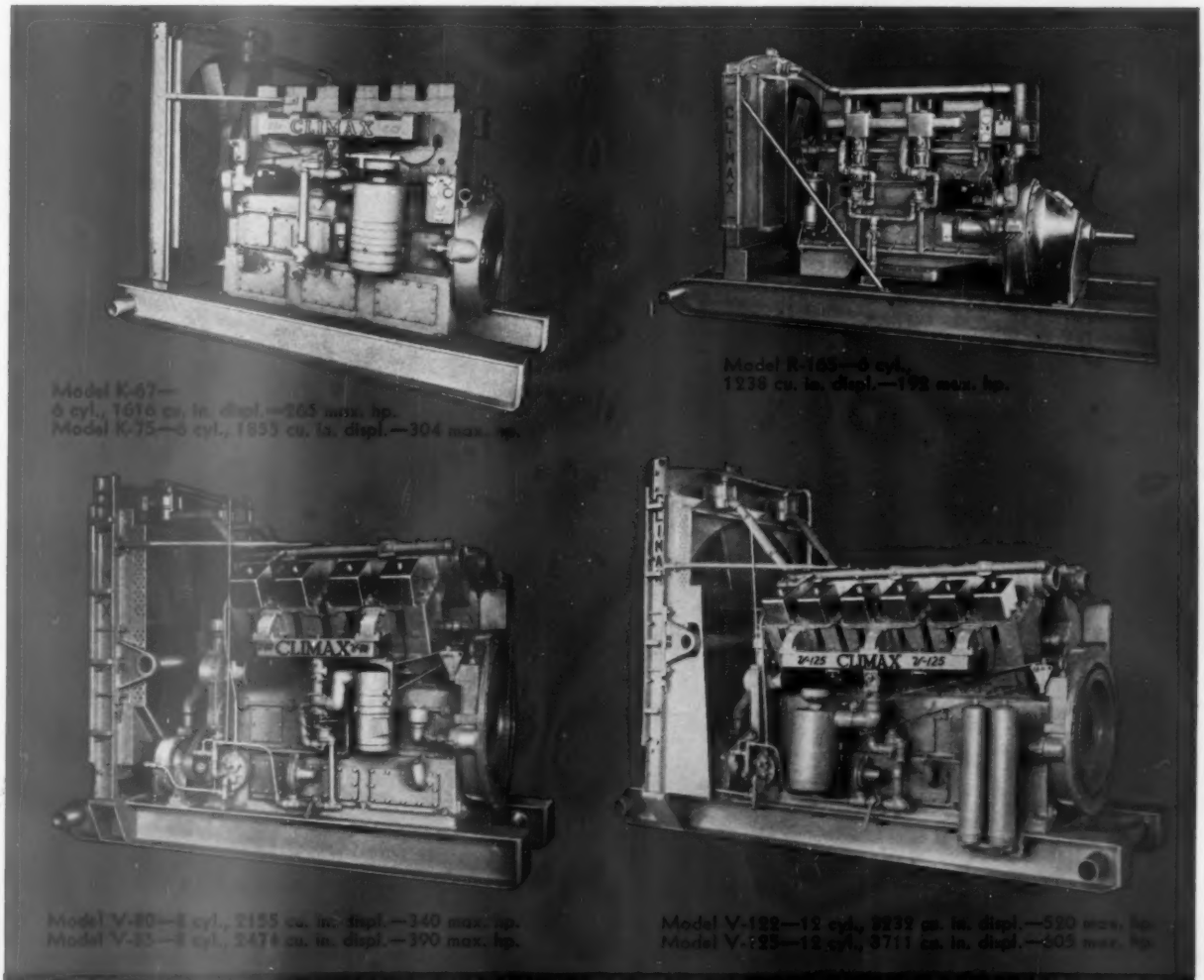
CLIMAX
Model K-67—
6 cyl., 1616 cu. in. displ.—265 max. hp.
Model K-75—6 cyl., 1853 cu. in. displ.—304 max. hp.
Model R-165—6 cyl.,
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Model V-80—8 cyl., 2155 cu. in. displ.—340 max. hp.
Model V-85—8 cyl., 2474 cu. in. displ.—390 max. hp.
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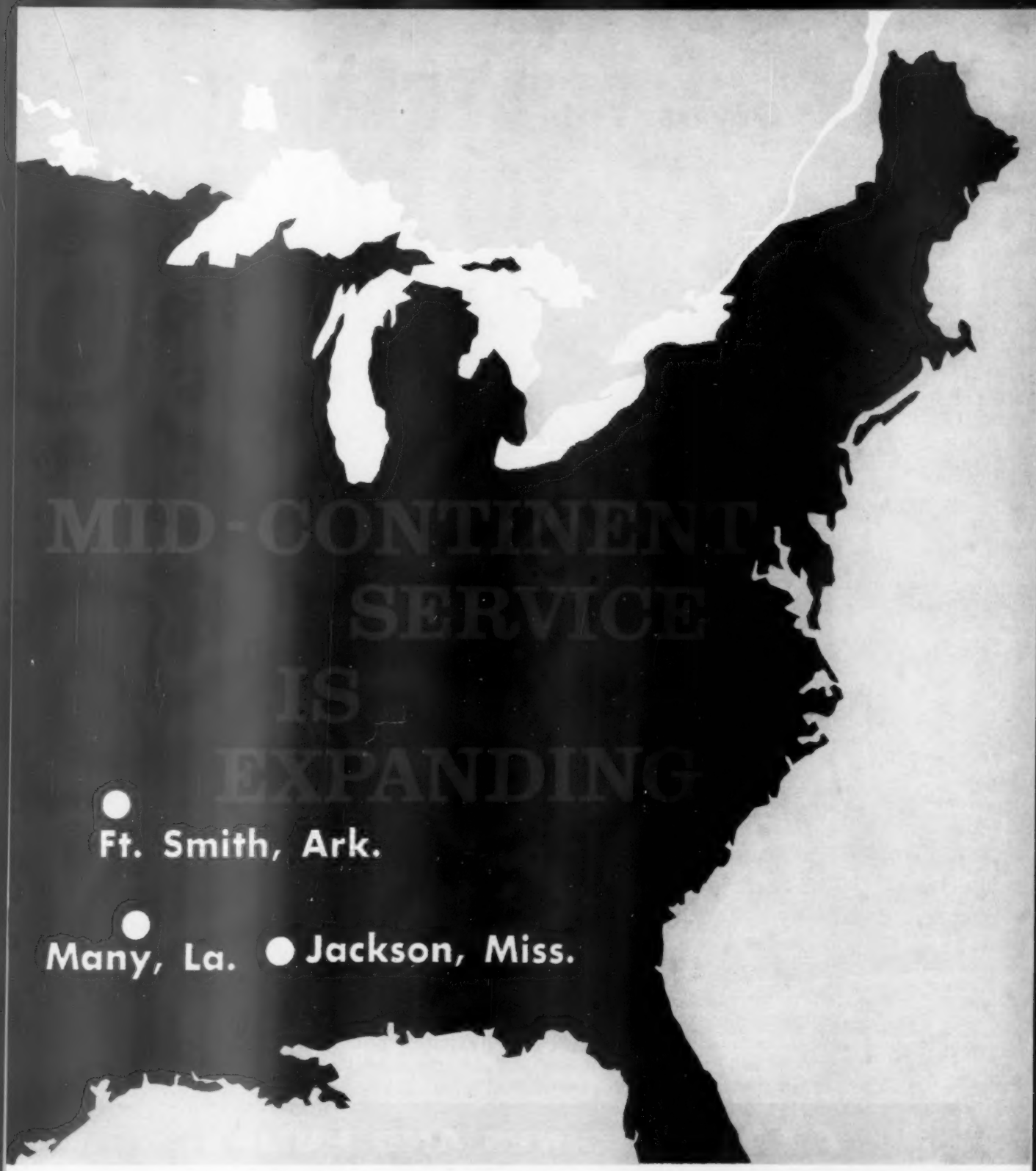
CLIMAX ENGINE MANUFACTURING CO. • DIVISION OF WAUKESHA MOTOR COMPANY

FACTORY—CLINTON, IOWA

Mid-Continent Supply Co. continues to grow—expanding services to meet the requirements of a dynamic industry. Examples of that growth are three new stores and three new sales offices to better serve the Mid-Continent area, the Rocky Mountains and the Southeastern States. New stores have been opened at Enid, Oklahoma; Vernal, Utah; and Bartley, Nebraska. New sales offices have been established in Fort Smith, Arkansas; Jackson, Mississippi, and Many, Louisiana. WHATEVER . . . or WHEREVER your supply requirements, you can depend on Mid-Continent Supply Co. for sure service, sure supply.



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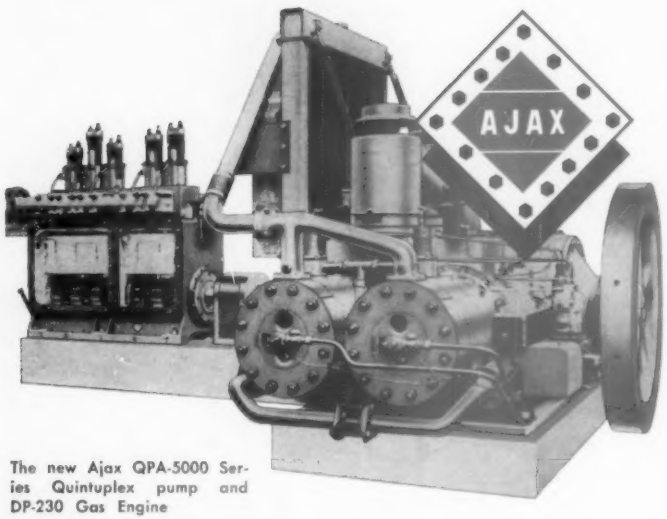
- **Control engine speed to load and water requirements.**
- **Engineered to actual horsepower requirements without destructive overload capacity required by instantaneous starting demands**



The new Ajax QPA-5000 Series Quintuplex pump and DP-230 Gas Engine

The need for dependable electrical power still remains one of the weak links in the usual automation installation — especially in remote locations and under certain climate conditions.

Ajax time proved engineering has now solved many of the automation-electrification problems. Automation today is economically sound if the equipment and the installation are designed to meet your particular problems. Contact your Ajax distributor today for the full story on automation without external electrification.

Ajax gives you true economy because of simplicity of design, ease of maintenance, extra long life, and 83 years of quality craftsmanship experience.

AJAX ENGINES AND PUMPS

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Oil Field Distributors

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- Bethlehem Steel Co. — Supply Division, Tulsa, Oklahoma
- Mid-Continent Supply Co. — Fort Worth, Texas

Going Great Guns in Houston. The majors have taken over on all fronts: Baseball operations with the Colt .45's, Houston's new National League Baseball team. Oil, with the domiciling here of domestic operations for many major oil companies. The result is that more and more interested companies are setting up a watching post here for the one and a listening post for the other. As the principal business bank in Houston, The Bank of Commerce can help you with contacts, advice, and, of course, all bank services including an **experienced** Oil and Gas Department.

your new direction GO

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MAIN, TRAVIS AND CAPITOL

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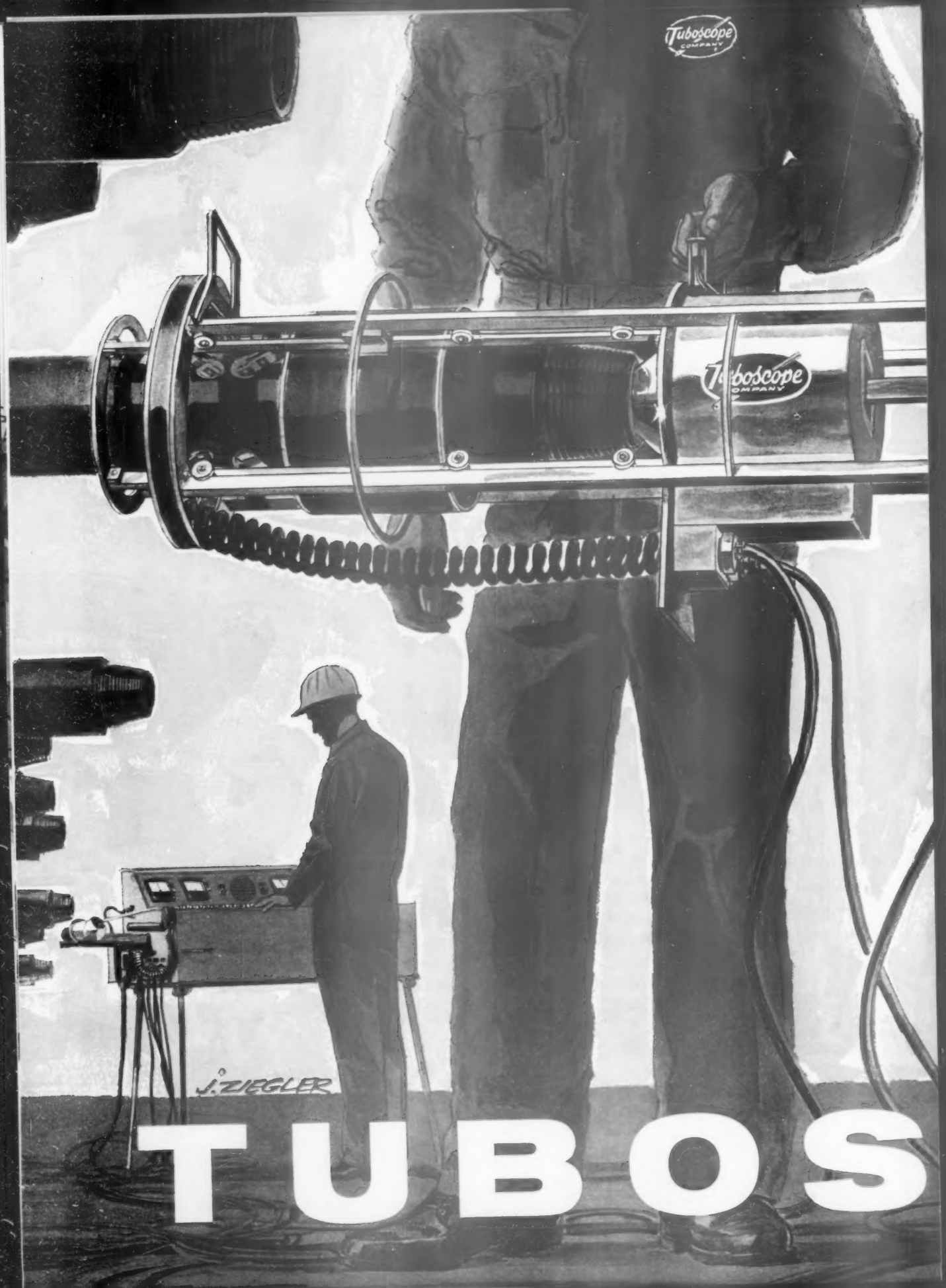
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NOW! Drill pipe end areas electronically inspected with new electronic end area inspection instrument

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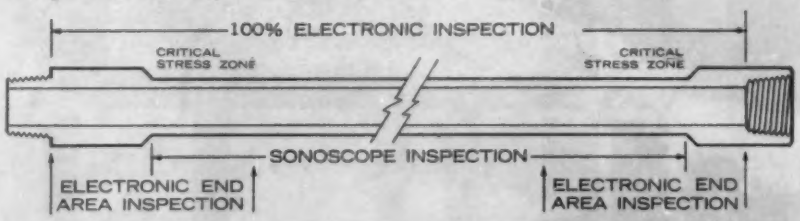

You can select reusable drill pipe with confidence never before possible.

Many Drill Pipe Failures Occur in the End Area

Increasing demands for faster drilling mean more stress in drill pipe end areas. Now Tuboscope offers a superior method of inspecting this danger zone.

Potential Failures Eliminated From Your String

Now you can select, in complete confidence, good drill pipe for re-use and discard that which is dangerous to continue in service. Tuboscope electronic end area inspection, when used in conjunction with superior SONOSCOPE® with MINIMAX,* gives you the world's most reliable drill pipe analysis. For a demonstration of this new concept in drill pipe inspection, contact your nearest Tuboscope representative.

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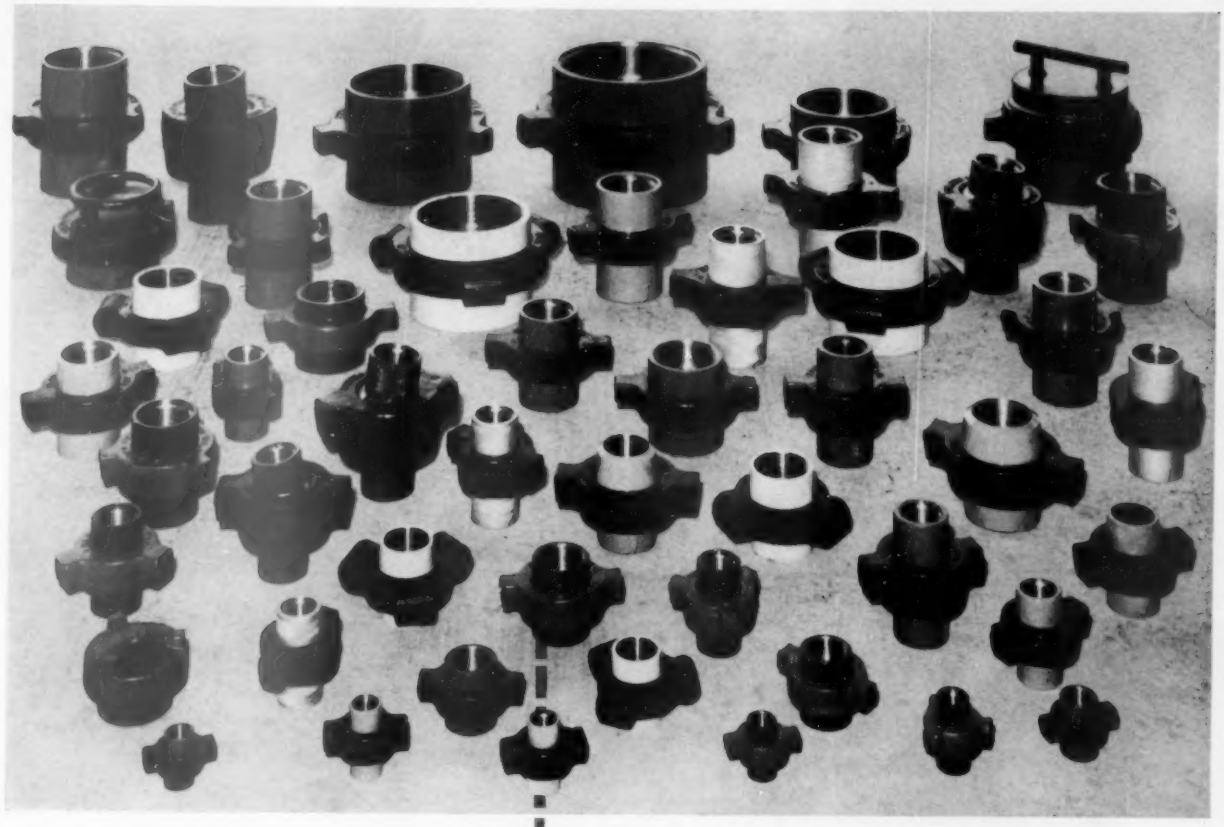

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MOST COMPLETE LINE OF WING UNIONS IN THE WORLD

THERE'S A SIZE, TYPE AND PRESSURE RATING FOR EVERY OIL INDUSTRY SERVICE

Here is part of the most complete line of wing unions in the world. Sizes range from 1" through 12"; pressure ratings from 1000 psi to 15,000 psi. The line includes pump suction, mis-aligning, insulated, flat face and blanking unions, in addition to standard types.

From this complete line you can choose exactly the union you need for every piping and fitting requirement on your drilling rig . . . for field headers and manifolds . . . for tank, separator, heater, treater and other production equipment installations . . . for cementing, acidizing, and fracturing service equipment. Standardizing with WECO Unions in all of your operations simplifies piping hook-ups; saves time on fitting and equipment installations; eliminates the problem of mis-matched piping connections; reduces inventory and replacement costs.

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722-MILE FINGER TIP COST CONTROL

for Pacific Gas Transmission Company
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will allow maximum personnel efficiency and optimum operation for the 722-mile Pacific Northwest portion of the new Alberta-California pipeline system.

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Accelerate your cost reduction program.
Call the pioneers in solid-state pipeline control...

Dresser/SIE equipment is also in use or being built for: Colorado Interstate Gas Company, Continental Oil Company (Cherokee Pipe Line Co.), Mountain Fuel Supply Company, Magnolia Pipe Line Company, Continental Oil Company (Glacier Pipe Line Co.), Tennessee Gas Transmission Company and Nordberg Engines.

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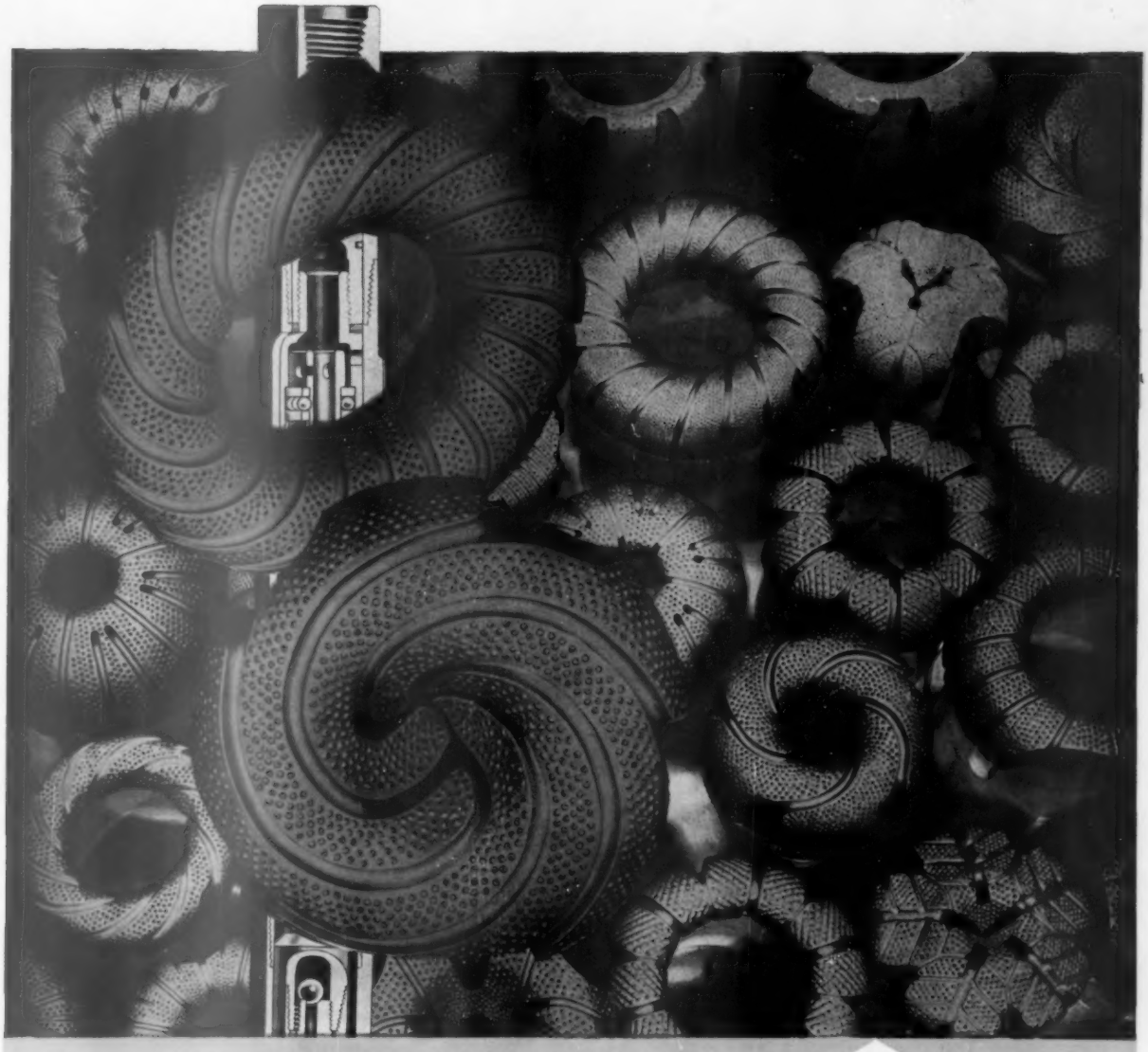
DIVISION/ONE OF THE DRESSER INDUSTRIES
10201 Westheimer, Houston 42, Texas



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SERVICE FROM WORLD-WIDE SALES OFFICES AND MANUFACTURING PLANTS

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NEW

SOLID-STATE ANNUNCIATORS BY EDISON

IN MODULAR UNITS OF UNEQUALLED RELIABILITY AND COMPACTNESS

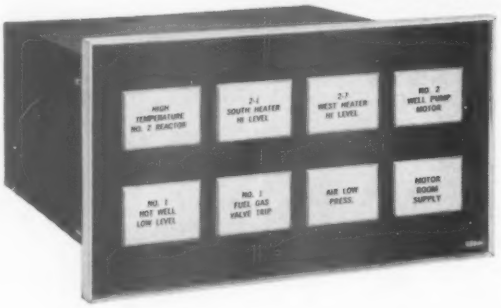
With a revolutionary concept in annunciator design, Edison is the first to offer both conventional and miniaturized systems, **fully transistorized** in compatible cabinets for either console or panel mounting. Each annunciator circuit, including lamps and light box, is completely contained in a miniaturized channel-mounted plug-in module—a unique Edison development. The modules are entirely without moving parts, and maximum reliability and exceptionally long life are further ensured by derating of all components.

In addition to 4- and 8-point cabinets with miniature ¾″ by 1½″ nameplates, Edison's new line of transistorized annunciators also includes 4- through 48-point cabinets with standard 2″ by 3″ nameplates. The miniaturized 4- and 8-point systems are ideal for consoles or graphic panels where space is limited. Each of the readily interchangeable plug-in modules is engineered for the widest practicable range of applications, and for the utmost in thermal and mechanical ruggedness. And the basic modular design is calculated to facilitate growth in step with the increasing sophistication of your operating system.

For complete technical data — and for information on how the new Edison annunciators combine the ultimate in protection with a dramatic reduction in over-all size — ask your Edison Representative or write for Catalog 3060.

EDISON MODEL 360 Miniature Annunciators

EDISON MODEL 361 Standard Annunciators


HIGH TEMPERATURE NO. 2 REACTOR
2-1 SOUTH HEATER HI LEVEL
2-7 WEST HEATER HI LEVEL
NO. 2 WELL PUMP MOTOR
NO. 1 HOT WELL LOW LEVEL
NO. 1 FUEL GAS VALVE TRIP
AIR LOW PRESS.
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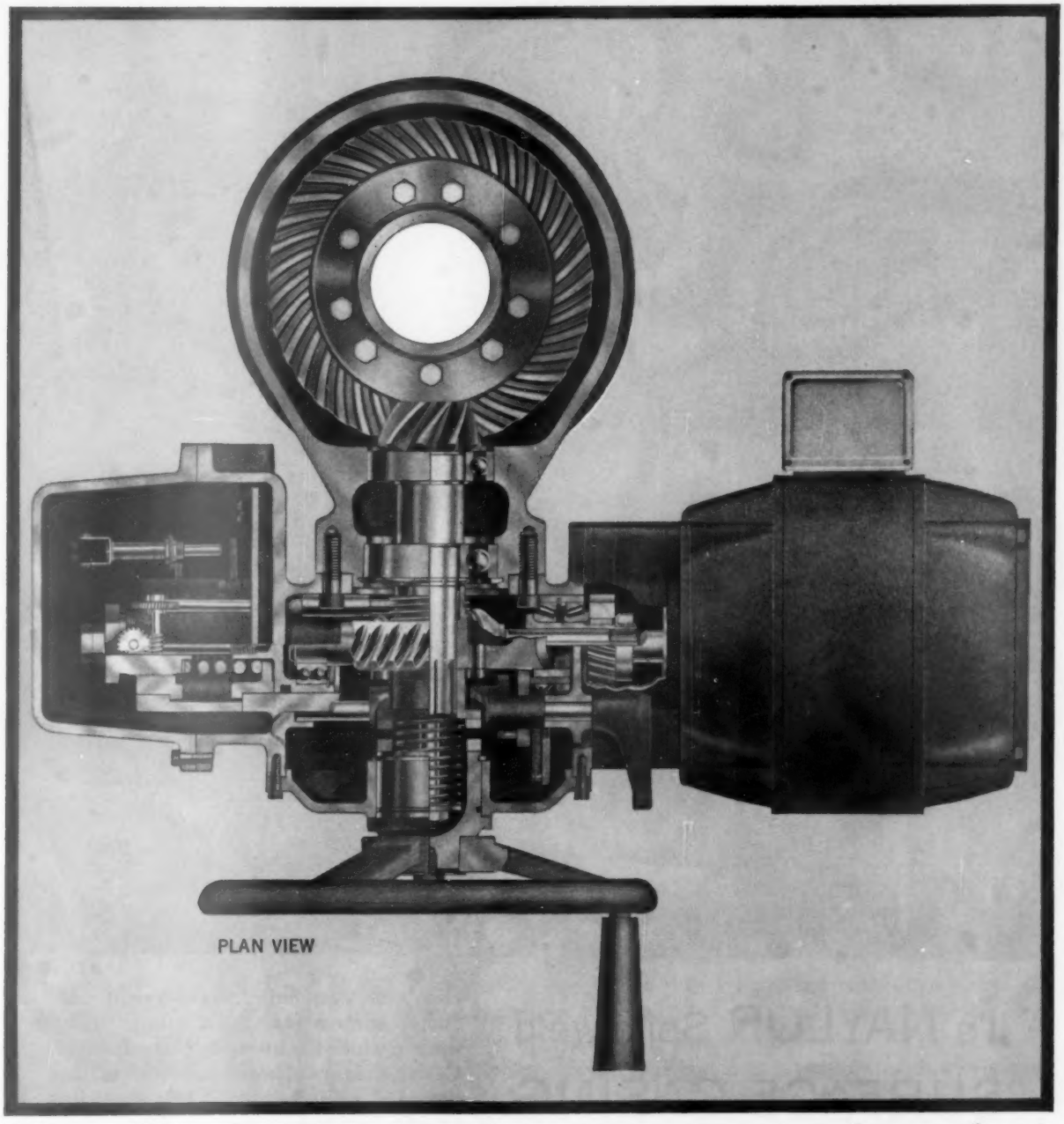

Now—"Crane Teledyne" motor operator for valves

It's new and only from Crane!

Today Crane is the only full line valve manufacturer that offers its own motor operator; this simplifies and speeds up your ordering and installation. And you get undivided responsibility for performance from one manufacturer.

"Crane Teledyne" was designed to provide torque only (thrust is taken on valve parts). This feature results in lower cost, smaller size and less weight than other operators with comparable output ratings.

We specifically designed "Crane Teledyne" for a wide variety of Crane valves. You can order it in two ways: as a conversion kit to motorize present valves in minutes; or fully motorized Crane valves straight from stock.

The motor operator is equipped to act as a gear-operated valve (4:1 ratio) in case of electrical emergencies. Available with push-button control or can be programmed for automated operation.

For full information, call your Crane distributor. Or write Crane Co., Industrial Products Group, Dept. G, 4100 So. Kedzie Ave., Chicago 32, Ill. In Canada: Crane Ltd., 1170 Beaver Hall Square, Montreal, Que.

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HEART
OF HOME AND
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It's NAYLOR Spiralweld SURFACE CASING

...with Threaded or Slip Joint Ends

Here's an economical, light-weight conductor surface casing for rotary drilled wells in which the casing is to be cemented. Casing ends are of heavy steel plate, either threaded accurately to A.P.I. standards or plain for slip joint welding. Store stocks are carried in 30-foot lengths for threaded casing or 40-foot lengths for slip joint casing. Write for Bulletin No. 760 or call our distributor.

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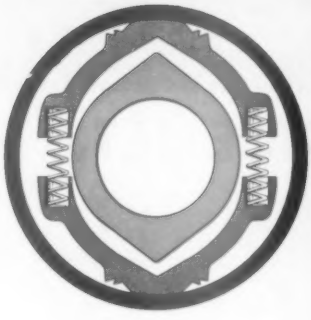
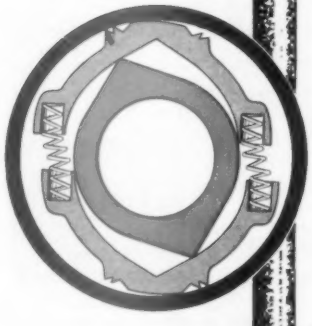
EXCLUSIVE DISTRIBUTORS IN MID-CONTINENT AND GULF COAST AREAS: **MID-CONTINENT SUPPLY CO.** • Fort Worth, Texas and Branches





BROWN CAM-LOK PACKERS

thrifty • positive • versatile

These simple rugged packers set easily, seal positively and release readily. They can be set with weight, conventionally, to seal off the casing where a dependable, economical packer is desired. They can be run inverted and set with tubing in tension for fracturing, for water flooding or where high bottom hole pressure makes a weight-set packer undesirable. They can be set with tension to prevent tubing buckling – in a pumping well, for instance. For an economical tubing anchor or tubing catcher, leave off the sealing element.

Just rotate the tubing enough to unjay the setting mechanism and slack-off to set it in the weight set position – or pick up to set it in the tension position. The unique cam mechanism grips the casing like an inside pipe wrench. The packer is released by vertical movement. It is economical, simple and trouble-free, easy to set and can be set repeatedly. It is easy to redress – only a rubber seal to replace. Just call the Brown Representative for full details.

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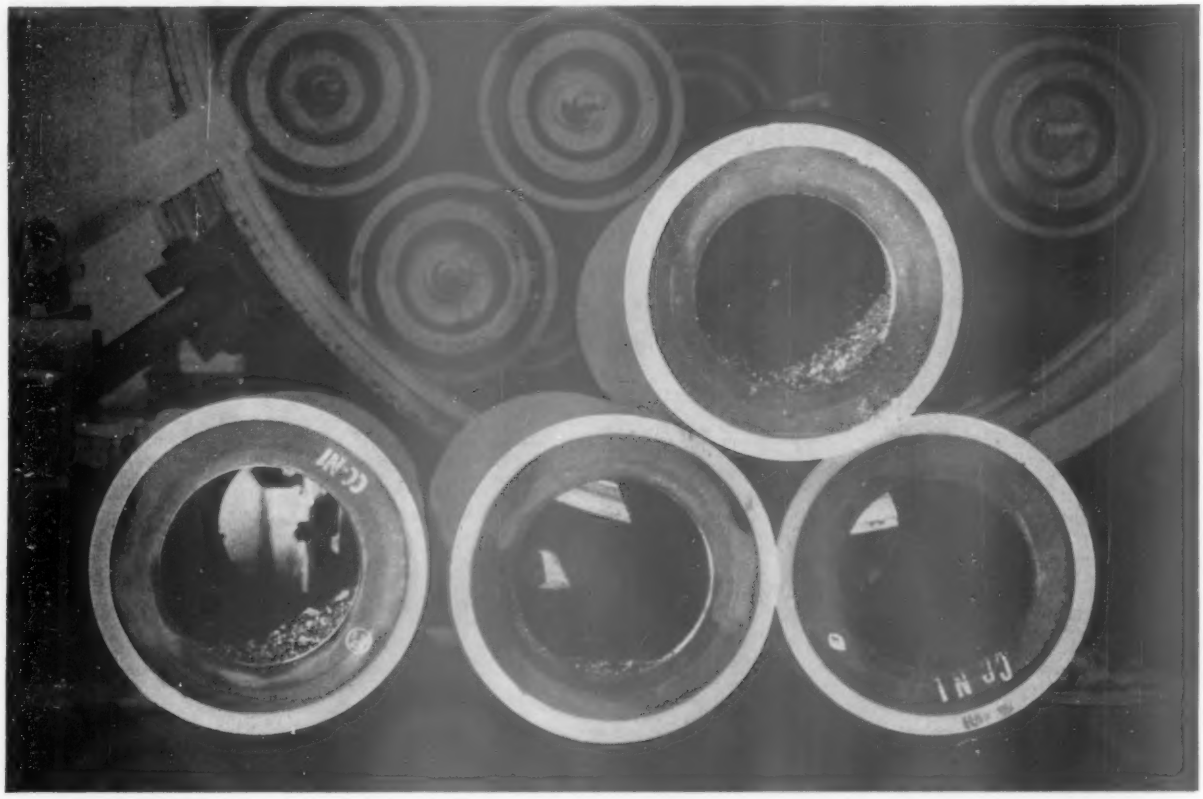


THAT WARNER LEWIS PROTECTS THE JETS WITH 2 STAGE WATER SEPARATOR/FILTERS

The unretouched photo above proves our point. Note accumulation of scale and dirt in the first stage cartridge where water is coalesced, and microscopic solids are filtered from the fuel. Second stage separator cartridges stop coalesced water and serve as an extremely efficient back-up filter stage.

This contaminant was stopped in the Warner Lewis two-stage water separator/filter on a hydrant fueling cart just before fuel entered the aircraft tanks. Nothing but clean fuel filtered through this unit. That's why Warner Lewis is first choice in protecting the world's jet fleets from fuel contamination.

WARNER LEWIS COMPANY
BOX 3096 • TULSA, OKLAHOMA

For complete information on Warner Lewis 2 stage separator/filter protection write, wire or call:

WARNER LEWIS COMPANY

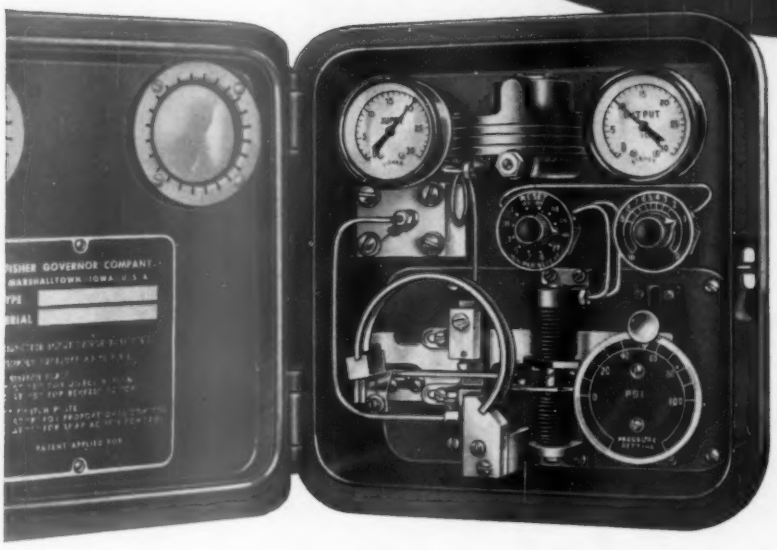
DIVISION OF FRAM CORPORATION

P. O. BOX 3096 • WEbster 9-6386 • TULSA, OKLAHOMA

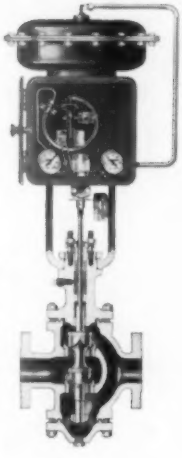
IN CANADA: FRAM CANADA, LTD., STRATFORD, ONTARIO

the Fisher man shows how to get.....

Accurate pressure control in spite of demand changes



WIZARD II
Pressure Controller



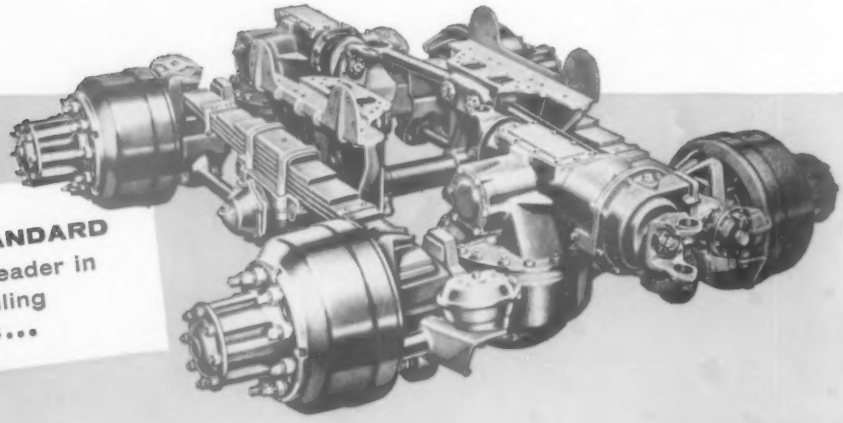
WIZARD I
PRESSURE CONTROLLER

The original Wizard I Pressure Controller is still available for those applications not requiring volume relay or reset features. The simplicity of a self-operated regulator and the accuracy of a pilot or relay operated regulator are found in the Series 4100U. This is, unquestionably, the reason for the continued popularity of the Wizard I series.

●Faster response to pressure changes provided by volume relay ● Pin-point control made possible by reset feature, adjustable from .005 to 1 minute per repeat ● Wide pressure ranges handled by brass, steel or stainless steel Bourdon tubes for 30 to 15,000 psi, Bellows assemblies for pressures below 30 psi and vacuum ● Easily reversed from direct to reverse action without additional parts ●Universal mounting on a wall, panel, or on yoke of control valve ●Compact construction consists of two sub-assemblies encased in weatherproof die cast aluminum housing, either can be removed without disturbing case mounting. *Write for bulletin No. D-4150B or D-4100 on Wizard I.* Fisher Governor Company, Marshalltown, Iowa. Plants in Woodstock, Ont., Rochester, England. Butterfly Valve Division: Continental Equipment Co., Coraopolis, Pa.

If it flows through pipe anywhere in the world ...chances are it's controlled by.....

FISHER® Controls SINCE 1880



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Acknowledged Leader in
Rugged Hauling
Operations...

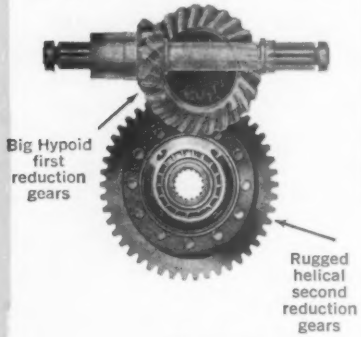
Here's why Timken-Detroit®

DOUBLE-REDUCTION TANDEMS LEAD IN TOP PERFORMANCE—LONG LIFE!

Timken-Detroit Heavy-Duty Tandems with Hypoid Helical Double-Reduction Gears are the big favorites for top performance and long life.
Here are some of the reasons why:

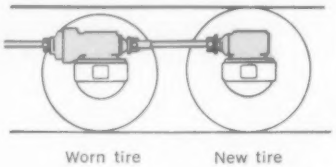
Rugged Hypoid-Helical Double-Reduction Gearing!

Balanced gearing—with two full-sized gear sets working in series to take an equal share of the load—provides a stronger power train with balanced gear set loadings and the widest range of ratios.



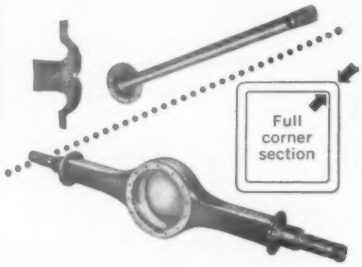
Driver Controlled Interaxle Differential!

Allows differential action between the axles to compensate for worn or mismatched tires. Both axles do equal amounts of work . . . can be disengaged at any speed, giving positive through drive when better traction is needed. *Straight-Line Through Drive* eliminates prop shaft angularity . . . increases bearing and gear life, reduces maintenance.



"Torsion-Flow" Axle Shafts and Hot-Forged Housings!

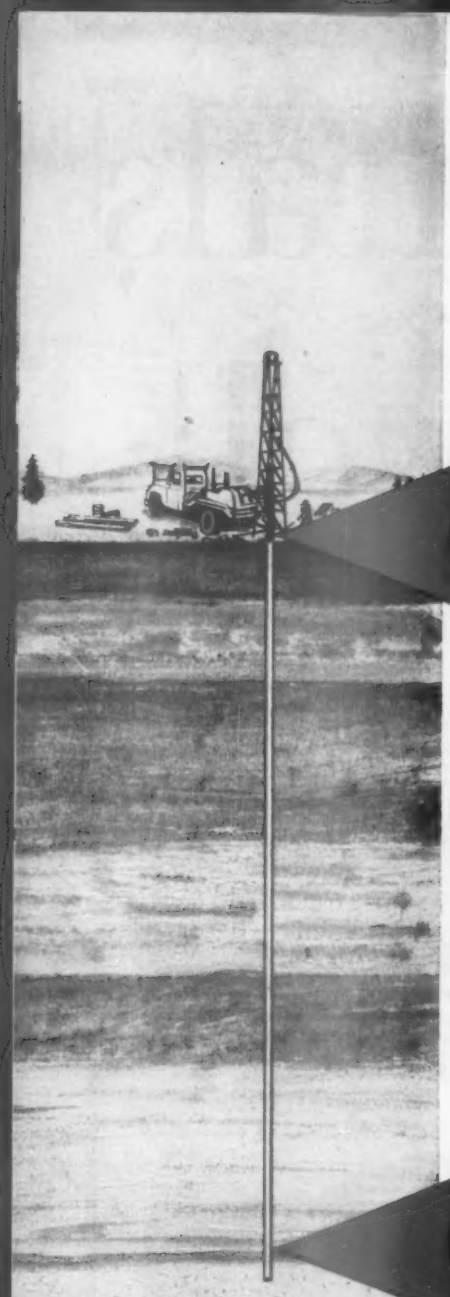
More splines, Torsion-Flow forging, and patented heat-treating processes make Rockwell-Standard shafts the toughest in the industry. Housings are hot-forged from high carbon steel, and are rectangular shaped with full strength corners for greatest strength with minimum weight.



Timken-Detroit Double-Reduction Tandems come in a wide range of capacities—6 models from 34,000 to 65,000 pounds.

Another Product of... **ROCKWELL-STANDARD CORPORATION**

Transmission and Axle Division, Detroit 32, Michigan



Layne
SINCE 1882

Layne Vertical Turbine Pumps are designed, engineered and manufactured by Layne in Memphis, Tennessee and nowhere else. Because pumping needs vary, there is a Layne pump for every pumping requirement—from 30 to 100,000 G.P.M. in sizes from 4 to 42 inches. Layne Pumps include Deep Well and Short Coupled (oil or water lubricated), Propeller, Mixed Flow, Regular and "In-Line" Submersible. For additional information write for bulletins 200-oil lubricated or 201-water lubricated.

has the only complete service that means

Water

The Layne Gravel Wall Well is an example of Layne experience, engineering and research. This gravel packing and 134 shutter screen employment affords larger screen openings, reduced friction, reduced draw down and pumping head. It increases specific capacity and makes for more effective retention of native sands. For additional information write for bulletin 900.

From top to bottom, you can depend on Layne for the most complete water service in the industry. This complete service provides undivided responsibility for the delivery of water . . . of the quality and in the quantity required. Over 75 years of *growing* service gives the skill and technical know-how which makes Layne First in the field of water. For additional information write for bulletin 10.

LAYNE OFFERS COMPLETE WATER SERVICE:

Initial Surveys • explorations • recommendations • site selection • foundation and soil-sampling • well drilling • well casing and screen • pump design, manufacture and installation • construction of water systems • maintenance and service • chemical treatment of water wells • water treatment—all backed by Layne Research.

Layne services do not replace, but coordinate with the services of consulting, plant and city engineers.

Layne
COMPLETE WATER SERVICE

LAYNE & BOWLER, INC., MEMPHIS

General Offices and Factory, Memphis 8, Tenn.

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

SALES REPRESENTATIVES IN MAJOR CITIES

pump rentals from Dowell

Handle your special pumping jobs economically with powerful, reliable pump trucks run by experienced Dowell operators

All Dowell pump trucks, from the smallest to the largest, are offered on a rental basis. They are practical, economical answers to many special oil field pumping problems.

Many operators use these Dowell-designed units for jobs such as killing wells, pumping test plugs, testing casing, circulating, spotting oil, transferring liquids, displacing fluids into formations and for miscellaneous mixing and pumping jobs.

These are the same reliable, heavy-duty pump trucks which Dowell uses in its fracturing, acidizing and cementing services. The reasonable rental charges include the services of an experienced Dowell operator. The next time you have a "do-it-yourself" pumping job, call Dowell. An engineer will help you select a Dowell unit to fit your needs. Dowell services and products are offered in North and South America, Europe, North Africa and Iran. Dowell, Tulsa 14, Oklahoma.

SERVICES FOR THE OIL & GAS INDUSTRY

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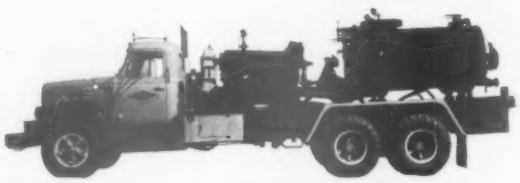
DIVISION OF THE DOW CHEMICAL COMPANY

ALLISON PUMPER. 615 hydraulic horsepower rated output. Pressures up to 10,500 psi. Volumes up to 828 gpm. Operates from remote control panel.

TWIN DIESEL PUMPER. 306 hydraulic horsepower rated output. Pressures up to 10,500 psi. Volumes up to 828 gpm.



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THEY SAY

We said a mouthful

Dear Sir:

You said a mouthful in your editorial of October 30 that "top executives do not know what is going on down the line in their own organizations," etc. ("What's wrong with marketing—No. 4," p. 97).

Alf M. Landon
Topeka, Kans.

Overdoing it

Dear Sir:

While we appreciate your enthusiasm over expected results from new Metex plant at our Philadelphia refinery, we cannot claim $31 million additional annual profit from this project as stated in your article October 30, Page 118. Profit figures should have been $1 million. I think you will agree this still represents a significant contribution.

R. D. Bent
Vice president, manufacturing
Atlantic Refining Co.

The $31 - million figure was a typographical error—Ed.

"Forced" pooling not pushed

Dear Sir:

Although I appreciate the attention you gave to my remarks at the recent meeting of the Texas Mid-Continent Oil and Gas Association (OGJ, Oct. 2, p. 113), I am somewhat mystified at both the headline and the second paragraph, for at no point in my speech did I advocate "compulsory" or "forced" pooling.

Estill S. Heyser, Jr.
Dallas

Who's confused, Blookey?

Mr. Merle F. Bruce Bleakley
District Production Editor
The Oil and Gas Journal

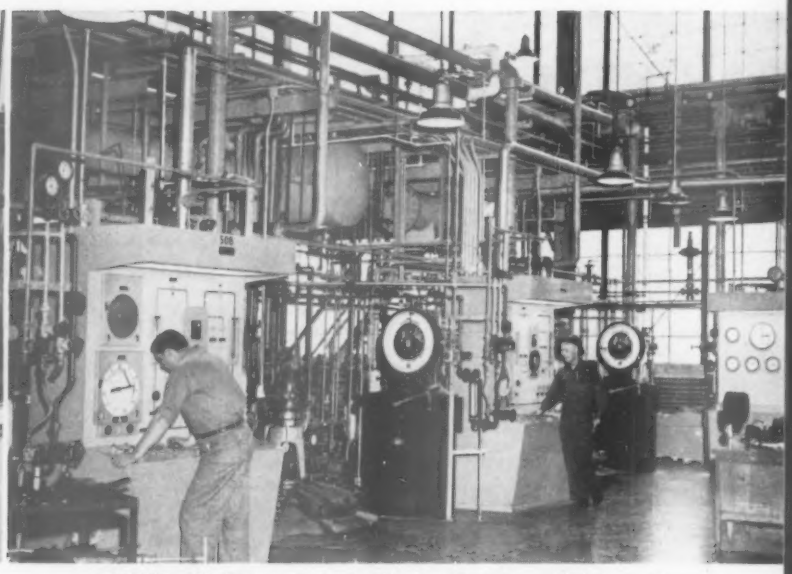
Dear Mr. Blakely:

Re "Journally Speaking" (OGJ, Oct. 30, p. 95):

It seems to me that you are attaching far too much significance to the possibility of confusion between you and the other fellow on the Journal staff who has a similar name.

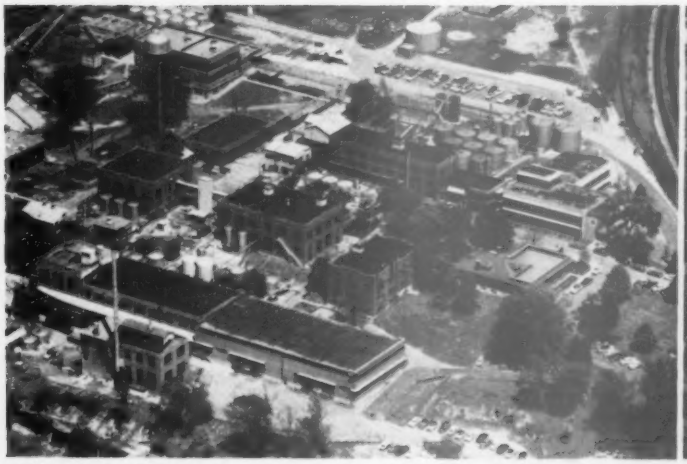
It is all perfectly clear in my

EMULSION SAMPLES are carefully tested in research laboratory at Brea, California. Tretolite technicians continuously seek new products to answer industry needs.



CONTROL CENTERS at St. Louis (illustrated), Brea, and Odessa, Texas, plants utilize latest equipment to insure uniformly high quality of Tretolite products.

RESEARCH...EXPERIENCE



PRODUCTION FACILITIES in St. Louis include research and development headquarters with pilot laboratories. Tretolite's founder, who originated the use of chemicals to break oil-and-water emulsions, was a St. Louis chemist.

CALIFORNIA PLANT at Brea is one of network of manufacturing operations providing widespread distribution of Tretolite products.

COMPANY-OWNED WAREHOUSE at Odessa—like those in St. Louis; Brea; Houston, Texas; Great Bend, Kansas; and Liverpool, England—facilitates prompt, economical deliveries.

ALWAYS AVAILABLE for on-site testing, computations, and recommendations is Tretolite field service engineer, shown here taking line sample at ACT station.

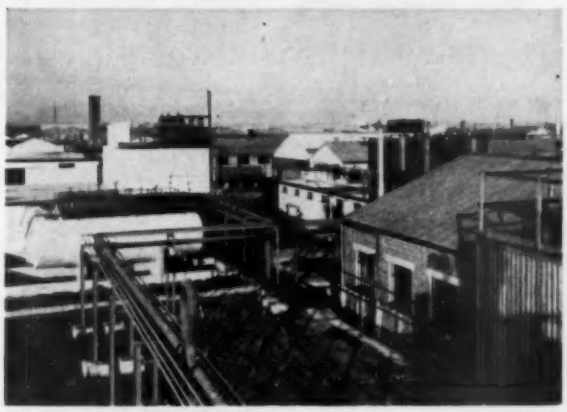
SERVICE ENGINEERS' assistance is offered wherever oil is produced or refined. Company planes are used to reach remote and off-shore locations.

IN-FIELD TESTING by the Man in the Red Car is familiar and valuable to oilmen in Canada, Latin America, and overseas, as well as in United States.

...SERVICE...result in

DOLLARS SAVED WITH TRETOLITE

Among the "ingredients" in every drum of Tretolite products are the company's unparalleled research, experience, and service—directed toward the most effective possible treatment of petroleum at the lowest cost. Tretolite's extensive laboratory and field research, constantly seeking new and better formulas, has produced more than 600 oil-treating patents. Tretolite pioneered in this highly-specialized work almost 50 years ago, and today maintains a larger staff of field service engineers than any other supplier of petroleum demulsifiers, corrosion inhibitors, paraffin removers, and other additives and preventives. For help in saving dollars wherever you treat crude, ask the Man in the Red Car.



MODERN MANUFACTURING facilities and laboratories near Liverpool, England, and Petrolite Limited's engineering staff in London produce Tretolite chemicals for the Eastern Hemisphere.

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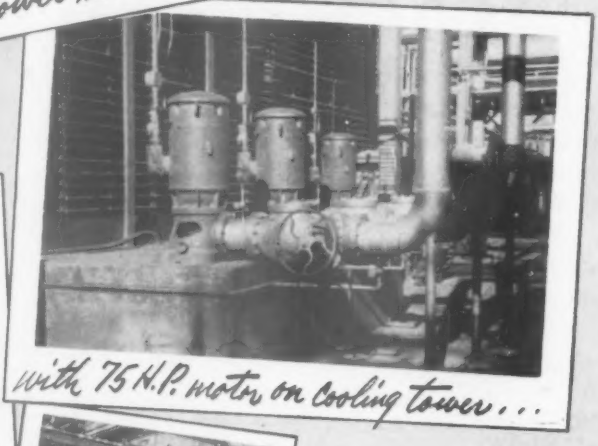
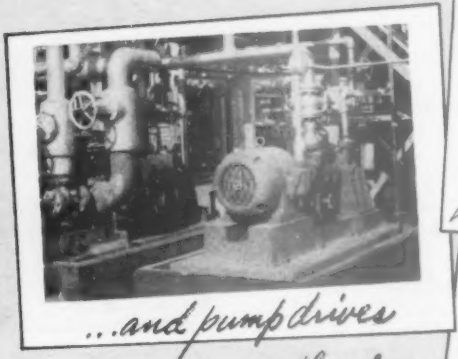
TF-61-2

This modern refinery is completely electrified with utility electric power throughout...

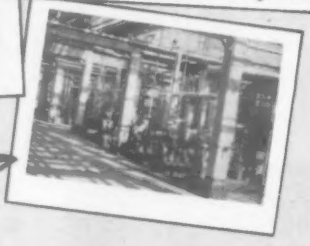
including this 2000 H.P. blower motor



with 75 H.P. motor on cooling tower...



...and pump drives



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Efficiency and economy of purchased electric power is winning more and more users in refineries, pipelines and production. For low cost dependable power consult your nearest Utility Electric Power Company today!

Petroleum Electric Power Association

P. O. Box 35006 • Dallas 35, Texas

List of P.E.P.A. members will be furnished on request.

mind. Blakely is the silver-haired chap who used to be on the Tulsa University faculty. Bleakley is the clarinet player who was formerly with the public relations department of Humble, nee Carter.

If further identification is necessary, everyone ought to be able to remember that Blookey is the one who sings, but not well, in the annual Gridiron show.

As I say, Blikely, it is all perfectly clear and I see no reason for further laboring the point.

Howard Upton
Executive secretary
National Association of
Oil Equipment Jobbers
Tulsa

The joint-costs problem

Dear Sir:

The Oil and Gas Journal is to be congratulated on publishing the series of brief articles on the Permian Basin area hearing (beginning Oct. 30, p. 109).

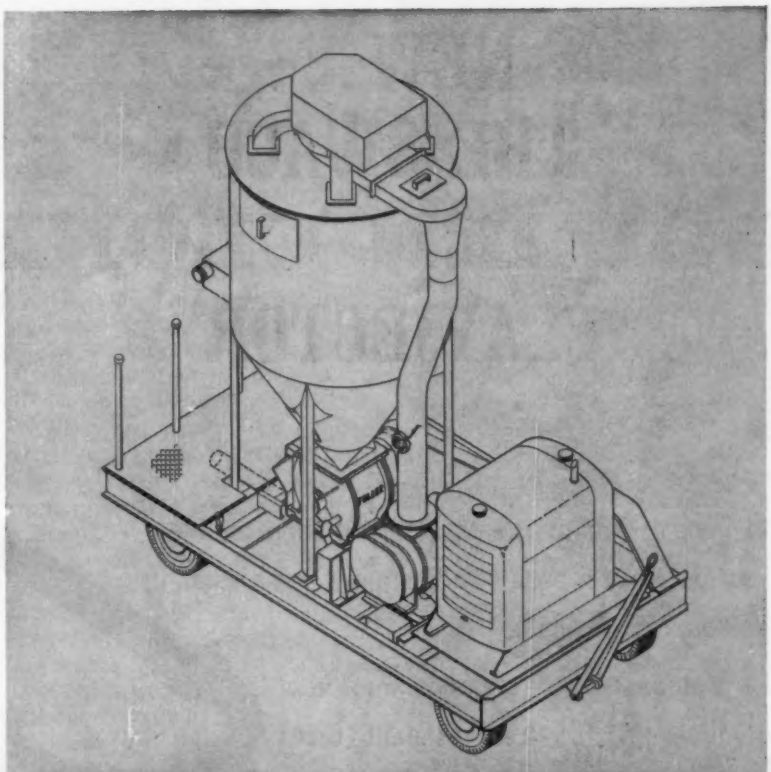
It certainly is desirable that all parts of the industry be kept informed.

Two sentences in the resume (OGJ, Oct. 30, p. 109) give me considerable concern because they are technically in error and with an unfortunate emphasis. The resume states that the producers "appear" to have solved the once-insuperable problem of allocating exploration and discovery costs between oil and gas" and that gas production is becoming "a separate operation from oil production and therefore joint oil-gas costs can be allocated as to gas with a reasonable degree of accuracy."

I know that in a brief article it is difficult to be precise, but the statements could lead to serious misunderstanding.

Exploration for gas is a separate activity only in areas that have been explored in sufficient degree that experience leads geologists and petroleum engineers to an informed opinion as to what probably will be found, whether gas or oil. Development drilling for gas and production of gas are not separate operations from liquids to the extent that gas and oil or natural gas liquids are found in the same reservoirs.

This is as it has always been, and so far as I am aware, the industry has made no progress in at-



Safe, clean, jam-safe transfer of dusty chemicals, grains and flours is now possible with the advanced filter design of this new pneumatic transfer unit.

Newest FULLER portable transfer unit handles dusty materials

Designed to handle a wide range of dusty materials such as plastics, chemicals, grains and flours, the newest Fuller Transfer Unit is a continuous filter type for dense stream pneumatic conveying.

Principal design feature of the new high capacity transfer unit is a newly developed, completely automatic filter. This unit is of extremely simple construction, its filter elements being cleaned continuously by a single master valve driven by a ⅛ hp. motor. The valve has only one moving part, the rotor, which is carried in two bearings, sealed for life.

Fuller Portable Airveyor Transfer Units are of the combination vacuum-pressure type, with the vacuum side picking up the material and the pressure side delivering it to the desired destination. Unit is available with power supply by either electric motor or gasoline engine (as shown here).

Low cost, rapid handling to and from cars, trucks, storage bins and silos is available for many granular and pulverized materials. Hook-ups are fast and the unit is quickly moved from one job to another. Materials movement is rated up to 20 tons hourly in 3″ or 4″ lines.

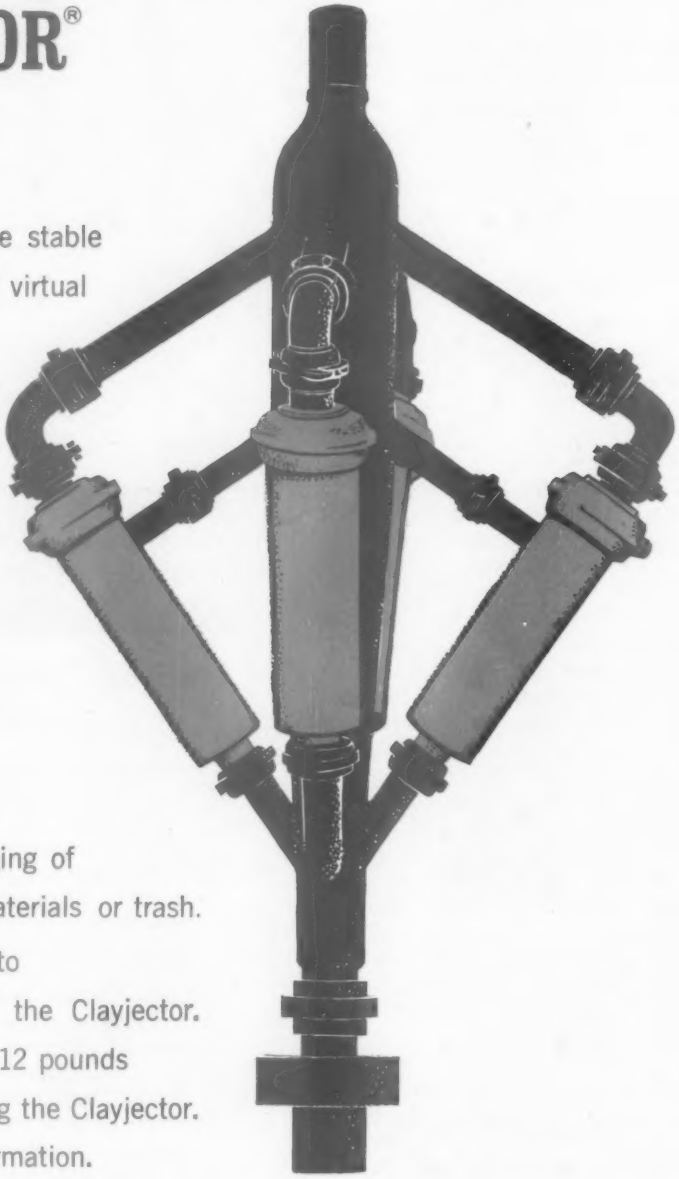
See Chemical Engineering Catalog for further details and specifications.

3140 A-220

FULLER COMPANY
132 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Offices in Principal Cities Throughout the World

Fuller
pioneers in harnessing AIR

NEW . . .
THE SWACO
GOLDEN CLONE
CLAYJECTOR®



Three major improvements result in more stable operation, greater ease of adjustment and virtual elimination of plugging.

New Golden Clone* cyclones feature a ceramic lining so wear-resistant that clone dimensions so essential to efficient operation remain unchanged even after months of use.

New pressure regulator for feed holds uniform correct pressure on cyclones. Single valve adjustment of dilution simplifies operation.

New SWACO Auto-Screen* prevents plugging of unit with drilled solids, lost circulation materials or trash.

These improvements have added greatly to the already outstanding performance of the Clayjector. If you are drilling with mud heavier than 12 pounds per gallon, you can cut mud costs by using the Clayjector. Ask a SWACO representative for full information.

*TM

SWACO

717 FT. WORTH NATIONAL BANK BLDG., FORT WORTH 2, TEXAS • Telephone: EDison 2-4433 • Cable Address: "SWACO" Fort Worth

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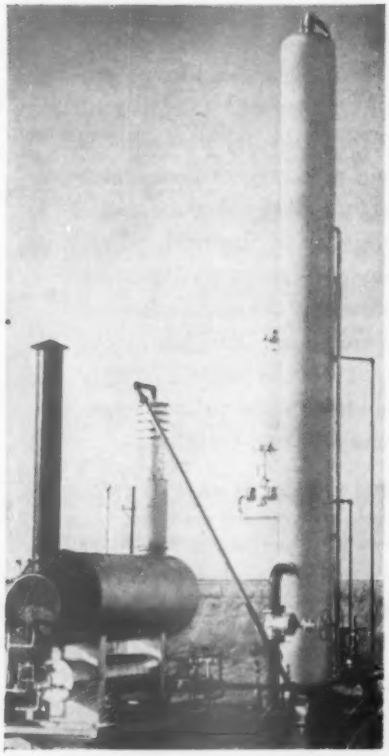
New Process Solves Gas and Condensate Co-mingling Problems



Maloney-Crawford's new Duo-Dry process eliminates the need for separate lines to carry your gas and condensate from the well to central facilities. It can accomplish this even when line heaters have not been satisfactory. In the Duo-Dry process, a single contactor vessel dehydrates gas, then uses this under-saturated gas to strip solution water from condensate. The gas then is dehydrated in the usual manner. The dehydrated gas and condensate can be recombined in the same pipeline without the danger of downstream freezing. It is a trouble free process using only proven contact methods. No untried desiccants. The savings can be large for isolated wells, especially those in colder climates, and offshore locations. Don't lay an expensive second line without investigating this low-cost alternative. Get the details today.

Maloney-Crawford

Designers and Manufacturers of
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tempts to reliably allocate truly joint costs. When costs are joint in the sense that neither product can be produced without the other, the costs incurred cannot be separated among the products, unless arbitrarily. If anything, the efforts over the last half dozen years have served merely to confirm this proposition.

However, with regard to costs of exploration—lease costs, geological and geophysical expenses and costs of exploratory drilling—there has been an important gain in knowledge of what probably will be found.

When the exploratory effort is made with an intent to find oil or gas separately, and the intent is with reasonable assurance, the exploratory costs cease to be joint and become direct costs of what is found. It is in this respect that the new studies assist the commission in exercising an informed judgment, not because there has been a gain in knowledge of how to allocate joint costs "with a reasonable degree of accuracy."

J. Rhoades Foster
Foster Associates, Inc.
Washington

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

NOVEMBER

26-Dec. 1 American Society of Mechanical Engineers, winter annual meeting, Statler-Hilton Hotel, New York City.

27-Dec. 1 National Association of Corrosion Engineers, southeast region conference and Florida general conference short course, Key Biscayne Hotel, Miami.

DECEMBER

3-6 American Institute of Chemical Engineers, annual meeting, New Yorker Hotel, New York City.

4 AIME's Society of Petroleum Engineers, Arizona section, annual meeting, Pioneer Hotel, Tucson.

4-6 Interstate Oil Compact Commission, annual meeting, Denver Hilton Hotel, Denver.

5-6 National Petroleum Refiners, Association, computer conference for refiners, Hotel Tulsa, Tulsa.

JANUARY

7-10 Pipe Line Contractors Association, annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

8-12 Society of Automotive Engineers, annual meeting, Cobo Hall, Detroit.

16-18 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville, Ky.

17-19 National Association of Corrosion Engineers, Canadian region eastern

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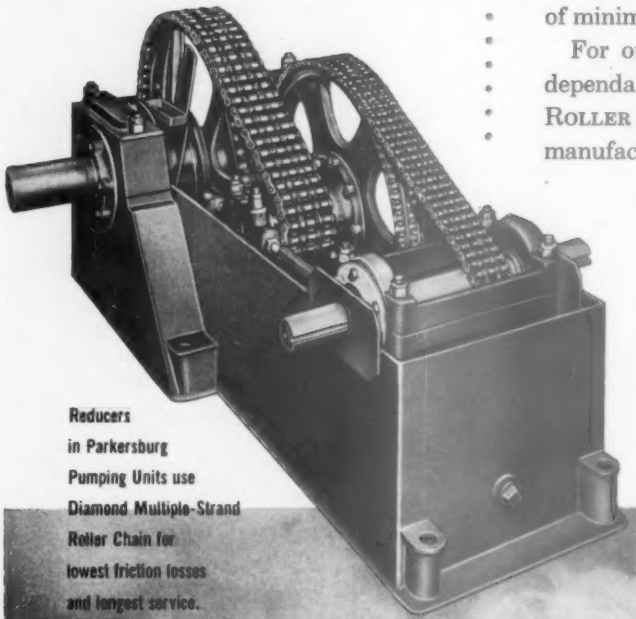


Reducers in Parkersburg Pumping Units use Diamond Multiple-Strand Roller Chain for lowest friction losses and longest service.

division conference, King Edward Hotel, Toronto.

19 Natural Gas Producers Association, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

24-26 American Society of Mechanical Engineers, second symposium on thermophysical properties, Princeton University, Princeton, N. J.

31-Feb. 1 National Petroleum Refiners Association, Gulf Coast regional meeting, Ben Milam Hotel, Houston.

FEBRUARY

4-7 American Institute of Chemical Engineers, national meeting, Statler Hotel, Los Angeles.

12-13 Missouri Oil Jobbers Association annual convention and trade exhibit, Hotel Chase, St. Louis.

14-17 Pipe Line Contractors Association of Canada, Castle Harbor Hotel, Bermuda.

14-16 Southwestern Legal Foundation, annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

16 Natural Gas Processors Association, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette.

18-22 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, New York City.

22 Chemical Institute of Canada, protective coatings division, Seaway Hotel, Toronto.

23 Chemical Institute of Canada, protective coatings division, Windsor Hotel, Montreal.

27-Mar. 2 International Oil and Gas Educational Center, institute on economics of the gas industry, Southwestern Legal Center, Dallas.

28-Mar. 2 American Petroleum Institute, Division of Production, southern district meeting, Rice Hotel, Houston.

MARCH

1-2 Southwestern Legal Foundation, conference on economics of gas industry, Southwestern Legal Center, Dallas.

2 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

4-8 American Society of Mechanical Engineers, gas turbine-process industries conference, Shamrock Hilton Hotel, Houston.

6-7 National Petroleum Refiners Association, eastern regional meeting, Sheraton-Cleveland Hotel, Cleveland.

15-16 Society of Petroleum Engineers of AIME, economics and valuation symposium, Dallas.

16 Natural Gas Processors Association, Oklahoma regional meeting, Sheraton-Oklahoma Hotel, Oklahoma City.

19-22 Kentucky Petroleum Marketers Association, management institute conducted by the University of Louisville, Brown Hotel, Louisville, Ky.

21-23 New England Gas Association, annual meeting, Statler-Hilton Hotel, Boston.

21-23 American Petroleum Institute, Division of Production, southwestern district meeting, Lincoln Hotel, Odessa, Tex.

26-29 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, joint annual meeting, Fairmont Hotel, Civic Auditorium, San Francisco.

27-29 American Society of Mechanical Engineers, power conference, Sherman Hotel, Chicago.

APRIL

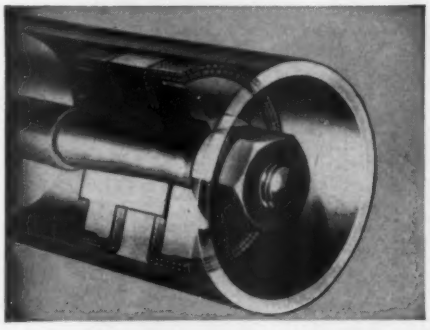
2-4 National Petroleum Refiners Asso-

PUMCUPS

outlast ordinary packings

3 TO 1

- *in hydraulic and pneumatic mechanisms*
- *in reciprocating pumps*



With Darcova Pumcups...regardless of wear, pressure keeps Pumcups hugging cylinder wall.

Operating costs go down and efficiency goes up when Darcova Pumcups go in! Here's why:

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- **Maintenance costs are reduced, because you have fewer replacements, less downtime.**

Available in three textures—hard, medium and soft. Also in regular or nylon composition. Size ranges from ¾" to 20". For *all* the facts on Darcova Pumcups, write for Bulletin 5903.

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DARCOVA
THE ORIGINAL COMPOSITION CUP

TRADE MARK
PUMCUPS

ciation, annual meeting, Granada Hotel, San Antonio.

3 Chemical Institute of Canada, chemical economics division conference, Royal York Hotel, Toronto.

4-6 API, Division of Production, Mid-Continent district meeting, Sheraton Oklahoma Hotel, Oklahoma City.

5-6 Society of Petroleum Engineers of AIME, upper Gulf Coast region, drilling and production practices conference, Beaumont, Tex.

9-10 Instrument Society of America, national chemical and petroleum instrumentation symposium, Wilmington, Del.

9-11 Mid-West Gas Association, annual meeting, Hotel Radisson, Minneapolis.

9-12 National Oil Fuel Institute, national oil heat and air conditioning exposition, Chicago.

11-12 Petroleum Industry Electrical Association and Petroleum Electric Supply Association, convention and exposition, Dallas.

11-13 API, Division of Production, Rocky Mountain district meeting, Hilton Hotel, Denver.

12-13 Society of Petroleum Engineers of AIME, new petroleum production and reservoir engineering developments, Mayo Hotel, Tulsa.

14-18 Petroleum Equipment Suppliers Association, annual meeting, Boca Raton Hotel, Boca Raton, Fla.

15-18 American Society of Mechanical Engineers, oil and gas power division conference, Shoreham Hotel, Washington.

17 Society of Plastics Engineers, Philadelphia section, regional technical conference, Sheraton Hotel, Philadelphia.

17-19 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

17-19 American Society for Metals, regional conference and exhibition, materials and materials processing for the petroleum, petrochemical and chemical industries, Shamrock-Hilton Hotel, Houston.

23-25 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Salt Lake City.

24-26 American Society of Mechanical Engineers, production engineering conference, Van Curler Hotel, Schenectady, N. Y.

25-27 Natural Gas Processors Association annual convention, Hilton Hotel, Denver.

29-May 1 Independent Petroleum Association of America, midyear meeting, Hotel Muehlebach, Kansas City.

29-May 1 Empire State Petroleum Association, spring convention, Statler-Hilton Hotel, Buffalo, N. Y.

29-May 2 Liquefied Petroleum Gas Association, annual convention and trade show, Conrad Hilton Hotel, Chicago.

30-May 2 Southern Gas Association, annual meeting, and American Gas Association, transmission conference, Rice Hotel, Houston.

30-May 2 API, Division of Transportation, annual tanker conference, Del Monte Lodge, Pebble Beach, Calif.

MAY

2-4 API, Division of Finance and Accounting, midyear meeting, Americana Hotel, Bal Harbor, Fla.

4 Chemical Institute of Canada, rubber chemistry division, Niagara Falls, Ont.

7-8 Society of Petroleum Engineers of AIME, North Texas section, fifth biennial secondary recovery symposium, Wichita Falls, Tex.

7-8 American Society of Mechanical Engineers, maintenance and plant engineering conference, Royal Orleans Hotel, New Orleans.

10-11 API, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

11 Natural Gas Processors Association, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

11-12 Kansas Independent Oil and Gas Association, annual meeting, Broadview Hotel, Wichita.

14-17 API, Division of Refining, midyear meeting, Fairmont and Mark Hopkins hotels, San Francisco.

16-18 API, Division of Production, eastern district meeting, Deshler Hilton Hotel, Columbus, Ohio.

17-18 Society of Petroleum Engineers of AIME, production automation meeting, Hobbs, N. M.

20-23 American Institute of Chemical Engineers, national meeting, Lord Baltimore Hotel, Baltimore.

22-23 National Petroleum Refiners Association, computer conference, Hotel Tulsa, Tulsa.

22-25 API, Division of Marketing, midyear meeting, Queen Elizabeth Hotel, Montreal.

23-25 API, Division of Transportation, annual pipeline conference, Denver Hilton Hotel, Denver.

23-25 Eleventh National Telemetering Conference, Sheraton-Park Hotel, Washington.

24-25 AIME, Rocky Mountain petroleum sections, annual joint meeting, Billings, Mont.

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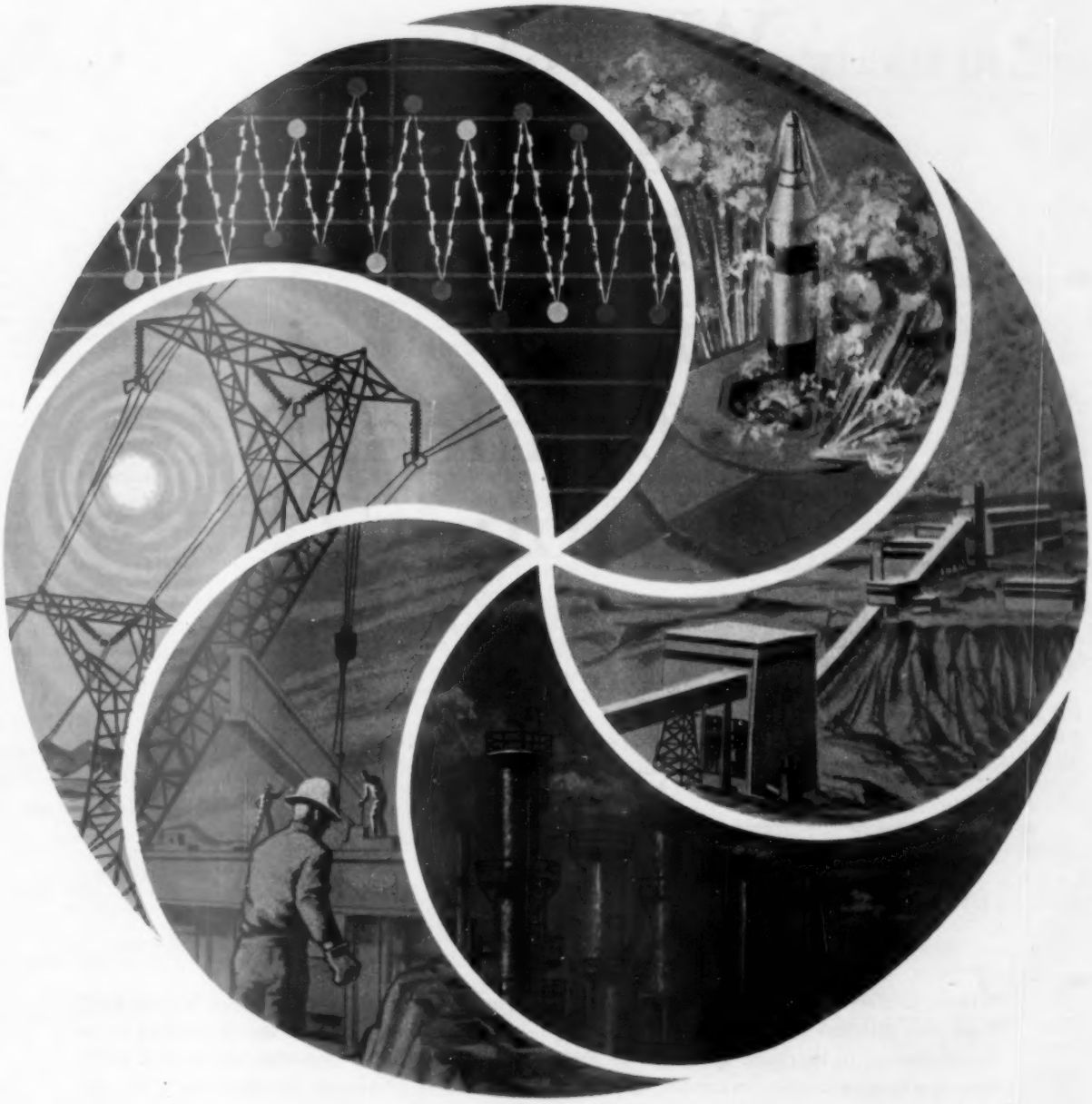

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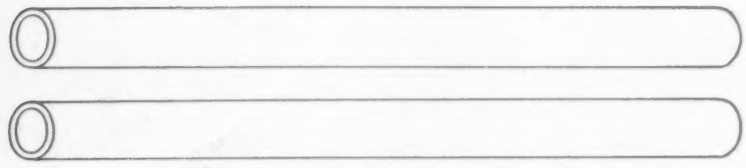
What's so different about stainless tubing?



What's so different about stainless tubing? Take two stainless tubes made by different manufacturers to the same specification. Put them in a heat exchanger. In service, they may react differently.

One tube successfully resists corrosion, the other doesn't. One holds up under pressure at operating temperature, the other fails. Why?

Basically, the difference in stainless tubing starts with who makes it.

One manufacturer maintains quality controls from melting of steel to finished tube. Another may not. One tube maker will carefully match stainless grades and properties to be sure the tube is *Job-Matched* to the user's specific requirements. Another won't. The differences go on and on.

The surest way to know how the differences in stainless tubing will benefit you is to know the manufacturer and what he can do. Then, specify his product by name when you order direct or through your Steel Service Center. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

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Seamless and welded tubular products, solid extrusions, rolled rings, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

THE JOURNAL SAID

50 years ago

November 23, 1911

Gulf Refining Co. acquires a site at Fort Worth for the erection of a refinery to take care of its rapidly growing trade in North Texas. The proposed plant will manufacture a complete line of kerosine, gasoline, and lubricating oils, with special attention to rapidly developing fuel-oil.

Eastern oil men are welcoming the new through-train service being started by the Frisco railroad from St. Louis to San Francisco. It uses the Oklahoma line to Tulsa, thence the A.V. & W. division to the Santa Fe, over the new Belen cutoff. Oil men now have excellent opportunity to visit the Mid-Continent fields and proceed to California without change of cars.

Electra, Tex., is beginning to look more like an oil town every day. Twenty-two arrests the past week for drunkenness, street fights and assaults with intent to kill are the best evidence of this, next to the finding of oil itself. Now, if it is a real live oil town, a few killings are in line.

25 years ago

November 19, 1936

Rapid expansion in exploratory work in all sections of the country where there is a possibility of finding new oil reserves was foreseen for coming months by oil men at the annual meeting of the American Petroleum Institute at Chicago last week. Alarm expressed over possible oil shortage.

Oil company reports indicate that for first time in several years, new incomes on the whole during 1936 will exceed tax payments.

10 years ago

November 22, 1951

Second major water-flood program for the Osage Nation of Oklahoma is placed in operation in the Mid-Burbank Unit. Formal gate-opening ceremony launches project expected to recover additional 5,000,000 bbl. of oil.

Harbor Department of city of Long Beach, Calif., launches huge dike-building and earth-filling project to save Wilmington field, jeopardized by continued land subsidence and sea-encroachment. More than 800 wells with annual income to Long Beach of $30,000,000 are affected.

Texas Railroad Commission approves unitization plan for pressure maintenance and secondary recovery of Canyon Reef formation in large Diamond M field of Scurry County. Lion Oil Co. chosen operator of large unitized project.

JOURNALLY SPEAKING

A swirl in a lab

THE DECLINE in the sale of lubricating oil per car-mile dismays and alarms refiners and marketers. But maybe they ain't seen nothin' yet.

The other day we saw a gadget that would really put a crimp in them—if it works.

The dean of an engineering school was showing a group through the laboratories where graduate students work on problems under contracts from various private and government agencies.

One whole lab was devoted to the hydraulic systems of high-flying airplanes. One r e a s o n why the planes sometimes can't get their landing wheels down, it was discovered, is that sludge and impurities prevent the hydraulic fluid from responding to extreme c h a n g e s in temperature.

So the lab developed better filters. Then it had to develop a better cleaning solvent to make the filters reusable. Then it faced the problem of filtering the gick out of the solvent and then cleaning that filter.

This looked like an endless cycle, so the lab is now working on ways of filtering without filters. It is trying ultrasonic vibrations and other things, but one of the most promising is an innocent-looking little metal cylinder that works like a centrifuge without a centrifuge.

Inside are spiral grooves, or something, that swirl the liquid under pressure and then force it to make a sudden U-turn and shoot out the top. At the point of reversal of direction the fluid is under a force of more G's than a satellite being launched, with the result that anything of a different specific gravity is separated out and drops into a little glass cup at the bottom.

"We're already able to take the dye out of a colored liquid," said the dean, "but we're still trying to make it better."

"That thing could have a lot of uses in industry," remarked one observer.

"Absolutely," said the dean. "One possibility being toyed with is to put one on every automobile instead of an oil filter. Then the motorist would just unscrew that little glass cup, dump out the sludge, add a tablespoon of fresh oil, and never worry about an oil change."

That may n e v e r happen. But here's the moral of the story:

Science and technology are moving so fast these days, and in so many different directions, that it's getting risky to make firm, long-range predictions about the future of oil or any other industry.

Oil-industry labs are working full blast to expand the uses for oil. Other fuels industries are researching just as hard to find new uses for their products. But other researchers, working on entirely unrelated problems for other industries, may unintentionally come up with something that could put them all on the skids.

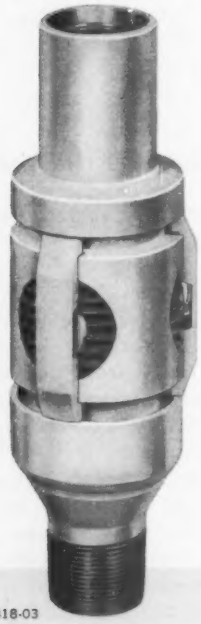
Personally, we don't have enough imagination to visualize keeping warm and moving people and things without hydrocarbons in some form or other. But then, neither can we visualize a swirl in a fist-sized tube making lube oil last forever. So we're about ready to believe anything.

We used to hear predictions that the world would run out of oil and gas day after tomorrow. The current fashion is to predict a steady increase in both supply and demand through the year 2000 or whenever. But now some idiots are predicting that we won't need any at all in a few years.

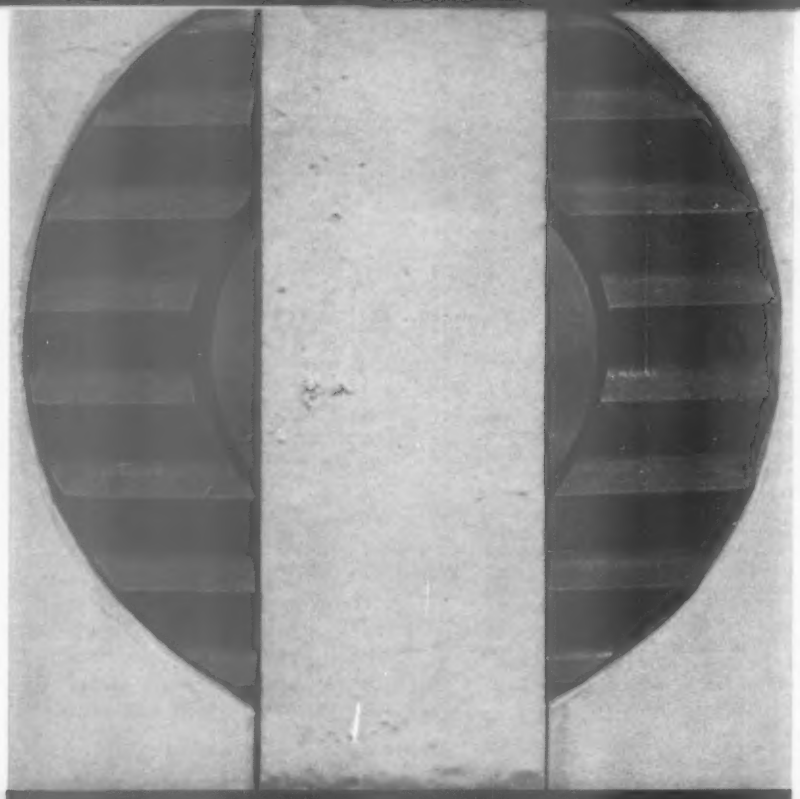
Take your choice. But if we were in the oil business we wouldn't pin our faith to anybody's long-range predictions but would keep ready to shift fast in any direction. A swirl in some lab could upset everything.

—Henry D. Ralph

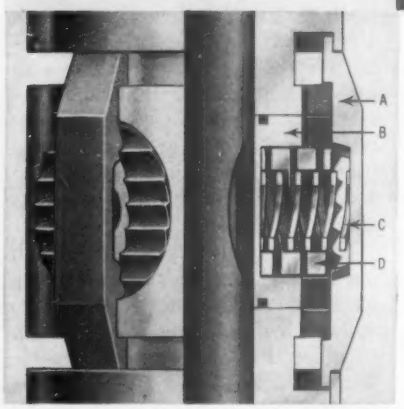
NEW!*



Product 418-03



* This unique slip button and retainer block combination represents a significant breakthrough in hydraulic tubing hold-down design.



THE SECRET OF SUPER-SPRING POWER

To prevent button dulling, retaining springs must be strong enough to resist pressure surges—yet they must not interfere with the operation of the hold-down. To get optimum spring performance, Baker developed a whole new design concept.

Look at the size of those corrosion-resistant springs shown above. Notice also that the Spring Retaining Block (A) is free to move inward or outward. The springs are placed *between* this movable bar and the Button (B). No matter what the inside diameter of the casing, effective spring travel remains the same. Thus the force required to push the buttons against the casing is always constant. Notice further that the smaller Inner Spring (C) forces the Blocks against the casing, but the large Outer Spring (D) undergoes no compression until it contacts the inner surface of the Retaining Block, as the button moves outward. This makes possible the use of a short, super-strength spring—one with sufficient inward thrust to resist pressure surges of over 100 psi, yet does not interfere with setting the hold-down in any weight of casing.

BAKER MODEL "K" TUBING HOLD-DOWN

VIRTUALLY ELIMINATES BUTTON DULLING

HOLDS ANY PRESSURE SAFE FOR THE CASING

OFFERS POSITIVE BUTTON RETRACTION

Here is the first hydraulically-operated tubing hold-down specifically designed to eliminate button dulling. Button dulling is the prime cause of hold-down failure, yet some hold-downs make no provision to keep slips retracted when pressure surges are encountered while running in. Others resort to ineffective leaf springs or snap rings.

Installed immediately above a hook wall packer, the Model "K" Hold-Down will prevent upward movement of the tubing and packer when pressure differentials are created below. Its extra-large buttons (three in the 5½", and four in the 7" size) provide more than ample holding power to withstand any pressure differential safe for the casing. The movable retaining blocks effectively center the hold-down and assure uniform loading of the buttons. Super-spring power (see left) assures positive button retraction, allows you to use this remarkable new hold-down repeatedly with minimum maintenance.

Ask your Baker man to explain more fully the unique engineering design that enables the Model "K" Hold-Down to outperform all others.

BAKER OIL TOOLS, INC. HOUSTON | LOS ANGELES | NEW YORK

BAKER

MODEL "K" TUBING HOLD-DOWN FOR USE WITH SET-DOWN HOOK WALL PACKERS

How API can guide a changing industry

THE AMERICAN PETROLEUM INSTITUTE has equipped itself with new leadership to cope with the changed conditions in the oil business. Under Chairman McCollum and Executive Vice President Ikard, API has an opportunity to bring a new sense of direction to the industry.

The challenge is to get the industry to prove what it has always professed—that competitive free enterprise can function without need for government intervention to keep it from destroying itself.

The problem is to provide all-industry vision and broad-gage leadership that will show the industry how to get along with itself.

THIS WILL TAKE AGREEMENT—but not the kind of agreement that is illegal. What is needed is agreement in attitude—an attitude that new times call for new approaches, and that where there's a will there's a way for the industry to solve its problems.

The industry's problems are composed of the problems of individual companies, and its troubles are largely caused by the things the industry has been doing to itself. Solution, therefore, lies in individual decisions.

Too many individual decisions have rested on patterns that worked when demand was expanding rapidly and the industry was not burdened with excess capacity in every division. Too often those decisions have made things worse, both for the companies concerned and for everyone else.

One result of this is that the industry is tending to group into warring segments, each determined to hold its own position regardless of what happens to the others—or to them all.

So the first task of API is to replace this splintering movement with some degree of unity, at least on understanding of the problems of other elements of the industry and their cause, and to reduce the extent to which the segments work at crosspurposes.

This requires clear analysis with an industry-oriented, rather than a company-oriented, view. Then a willingness to reexamine decisions and practices to be sure they fit changed conditions. Finally, initiative and resourcefulness in finding new and better ways of doing things.

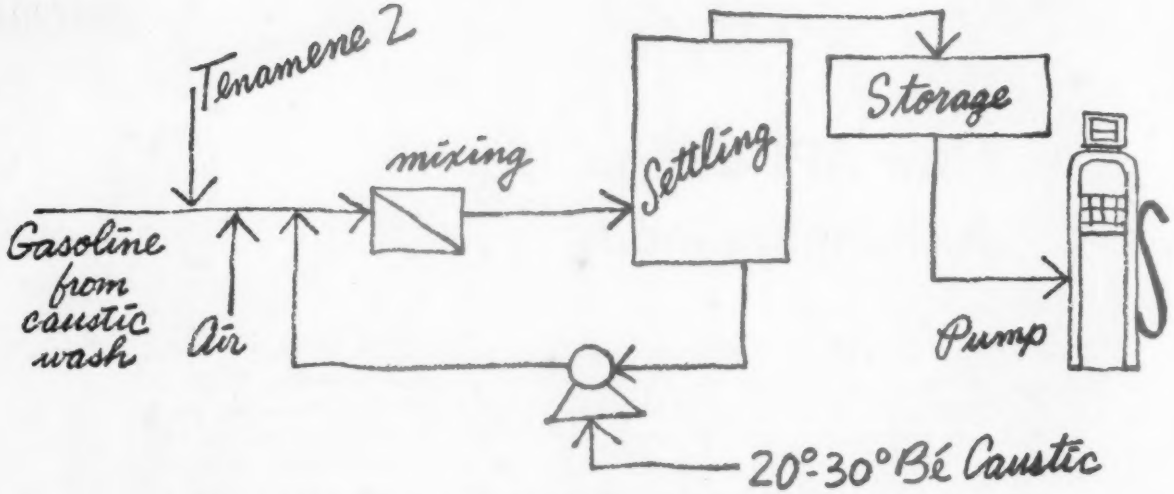
WHAT CAN API DO? It can persuade the heads of all oil and gas companies, large and small, to do these things:

Make decisions individually, based on the best analysis of what should be done, but with an eye on long-range as well as immediate conditions.

Then ask: how will others in the industry react? Will this be good or bad for the industry as a whole? Will the contemplated action open another can of worms and create more problems than it solves?

Then take a second look at those decisions.

By such a process oil can remain competitive, free, enterprising—and an industry.



For gasoline stocks that respond, the economy and simplicity of Tenamene 2 inhibitor sweetening can seldom be equalled by any other treating method

In the presence of caustic and oxygen, Tenamene 2 catalyzes the conversion of mercaptans to disulfides. Being insoluble in caustic, it remains in the gasoline stream to effectively inhibit the formation of gum in the finished gasoline. Thus, it both sweetens and inhibits in essentially one operation.

Tenamene 2 inhibitor sweetening is primarily of interest to processors of catalytically-cracked gasoline. The response of such gasolines to the inhibitor sweetening method can be quickly determined by the following test:

1. Using sour gasoline from the primary caustic scrubber or mercaptan removal unit, put 700 ml. into each of several one-quart bottles.
2. To one group of samples, add Tenamene 2 at a rate of 5 pounds/1,000 bbls. (14.25 mg./liter). To another, add 10 pounds/1,000 bbls. (28.52 mg./liter).
3. Add 10 vol. % of 15° Baumé caustic to each sample.
4. Stopper the bottles, shake thoroughly. Replace stoppers with notched corks and store samples in a dark place at room temperature.
5. Examine at 3-hour intervals and determine the time required for sweetening.

If the results of this test indicate Tenamene 2 inhibitor sweetening to be effective in treating your sour gasoline, we will be glad to aid you in making a detailed study of your sweetening and stabilization requirements. In this study we will help you determine the optimum processing values for your particular operation, including inhibitor concentration, caustic strength and proportion, acid oil content, process temperature and reaction time. For an evaluation sample of Tenamene 2 and more information on the Tenamene 2 inhibitor sweetening method, write or call your Eastman representative, or write to Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Company, Kingsport, Tennessee.

Basic Procedure for Tenamene 2 Inhibitor Sweetening
(see sketch)

The sour gasoline is washed with 10-15° Baumé caustic. Between 5 and 15 pounds of Tenamene 2 is added per 1000 barrels of hydrocarbon. A small quantity of air is injected into the stream and the gasoline contacted with 20°-30° Baumé caustic. The gasoline is allowed to settle, then pumped to storage. If not already sweet when it goes to storage, the gasoline should sweeten within a few hours after storage.

Tenamene 2 inhibitor sweetening is, in almost every instance, more economical than doctor or copper chloride sweetening. Unlike doctor treating, no regeneration step is necessary, and there is no reduction in tetraethyl lead response. Unlike copper chloride treating, Tenamene 2 inhibitor sweetening does not allow the possibility of gum-catalyzing, copper contamination.

Most refineries find that minor modification of existing procedures enables them to adopt this method.

Tenamene 2

an Eastman gasoline additive

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; Atlanta; Boston; Buffalo; Chicago; Cincinnati; Cleveland; Detroit; Greensboro, North Carolina; Houston; Kansas City, Missouri; New York City; Philadelphia; St. Louis.
Western Sales Representatives: Wilson & Geo. Meyer & Company, San Francisco; Denver; Los Angeles; Salt Lake City; Seattle.

NEW TEAM is welcomed at conclusion of annual meeting of API board of directors. Frank Porter, left, continues as president, while M. J. Rathbone, right, bows out after 2 years as chairman. In between are the new officials: Leonard F. McCollum, right, new chairman, and Frank Ikard, executive vice president.

API views a changed industry

We're in a new era which calls for a different approach to problems, speakers tell API. Over-all economics must now rule, and oil men must quit attacking other segments of the industry and running to Washington for help.

THE OIL business is changing.

The changes have put many squeezes on it. The way out of the squeezes is to understand the changes and adapt to them. Oil men are beginning to do this in a way which gives basis for optimism that the industry is turning a corner.

These conclusions echoed through the meeting rooms and corridor conversations at the annual meeting of the American Petroleum Institute where some 6,000 perplexed oil men exchanged views on every aspect of the oil and gas business.

The speeches were remarkably of a pattern: the industry has gone through a period of exasperation because traditional actions have not brought the expected reactions. Analysis shows the industry itself has brought on most of its troubles because it has been too slow in understanding the changed conditions. It has made some bad guesses.

It is now beginning to make a hard, factual appraisal of itself and is finding that it can cure most of its problems by resourceful initiative in taking new approaches.

But because of the increasing complexity and interdependence of the business, future policies must be based on economic considerations rather than operational decisions.

Recovery from the oil industry's recession won't come automatically with improvemnt in general business conditions; won't come by running to the Government for help; won't come by advancing one segment of the industry to the harm of others.

Recovery can be brought about by leadership which sees the whole picture of this changing industry and acts for the common good.

Improvement, in short, depends on how individual members of the industry handle today's problems and challenges.

There was little deep pessimism at the meeting, little disposition to panic. The general feeling was that things have touched bottom and that the turmoil and uncertainty are giving way to a pattern for improvement.

To reflect the spirit of the big meeting in one sentence: The oil industry is beginning to face up to reality.

Marketing problems. By far, the

chief topic of discussion was marketing, and the need to bring some rationality into the chaotic competitive and pricing conditions.

Minority voices suggsted federal regulation as a solution. A greater number viewed Government action as a threat unless the industry puts its own house in order.

But the majority agreed that the industry can straighten out its marketing mess by reappraising its policies and tailoring its actions to fit the changed conditions.

Soviet threat. Second in prominence was discussion of communism—the Russian economic war, with oil as the primary weapon—with Russia's threat to displace the West in world commerce and influence; and the internal threat of socialism undermining the traditions of free enterprise and liberty.

Oil men were challenged to team with Government in bold new plans for fighting Russian penetration abroad, and at home to be more vigorous in defending American principles and combating the infiltration of communistic ideas into government.

Outlook for demand. On the general outlook, it was agreed that economic conditions are improving and that consumer income will rise, but that normal forces will not keep demand for petroleum products increasing at the rate the industry had come to expect. Failure to realize this brought on the excesses in output and the market gluts, the intense competitive pressures and price cuts, and the industry's poor profits showing.

But the industry has now quit hoping that this will correct itself, and instead is turning to ways for expanding over-all markets and serving its customers more economically.

There was much talk about such experiments as increasing the amount of automobile travel, and new methods of using fuel oil to combat the encroachment of gas in the heating market.

Natural-gas regulation. Natural gas and its regulation by the federal Government had an unusually large portion of the official program at this meeting. The industry was told pretty bluntly that there is little chance that gas production will be exempted from regulation, or even that new legislation in the immediate future will simplify the regulatory problems.

Instead, any hope of a way out of this squeeze lies in the area-pricing approach. The new members of the Federal Power Commission are committed to this method and are determined to give it a try under the present law before considering anything else.

Production problems. The oil-producing end of the business did not escape attention, and there was renewed criticism of obsolete state conservation rules which invite overproduction and increase over-all industry costs.

The particular target was spacing and allowables formulas which cost the industry some half-billion dollars a year by requiring the drilling of unnecessary development wells, wells not needed either to sustain current producing rates or to get maximum recovery of oil.

Government regulations, it seemed agreed, are no worse than at many times in the past, and perhaps are improving. There was an absence of expressed antagonism between the Government and the oil business, and more of a disposition to discuss conflicts frankly and strive for an understanding of opposing viewpoints.

Public-relations tactics. Oil's public-relations problems had a far less prominent place on this program than at most API meetings in recent years. Notably absent was discussion of so-called Madison Avenue approaches — flamboyant campaigns to sway public opinion en masse.

Instead, there was much more stress on quiet, individual action by oil men in their own communities to impress their neighbors with the things that are good about the oil business and the conditions required to permit it to continue to service public needs efficiently.

Much of the API's formal program is being devoted to educational programs, to expanding demand for petroleum products, and to preparing policy statements which factually explain to the public the industry's views on controversial subjects.

Says Porter:

Don't blame government for your troubles, API president tells oil men.

BLAMING Washington for oil-industry problems is not a realistic approach, API President Frank Porter said last week.

Nor, he said, is there apparent reason for being apprehensive about the current administration's attitude toward the industry.

Porter said, "Let me remind you of this: our major problems of today, the ones that worry oil men most, do not stem from anything the administration has done to us.

"If the administration had been half as unkind to us as we have been to ourselves these past 10 months, then we really would have the right to give vent to angry protests.

"But we cannot place the blame for these problems on the White House or the Capitol or any of the official buildings that line the streets of Washington. These are homing-pigeon problems. They were hatched in the industry, and they come right back here to roost."

Other views expressed by Porter in his annual speech at the API included these:

Gas legislation. "Many of us are hopeful that success may soon be in sight with the long-deferred and much-needed remedial gas legisla-

Says John Kelly:

AN OIL MAN who is now a government official—John M. Kelly, assistant secretary of Interior—lectured the industry sharply last week on its tendency to run to government for solution of its problems rather than solving them on its own.

Kelly pulled no punches in the speech he made at the API.

"Although we have protested from the housetops against government interference in the oil business, we welcome the import quotas and urge greater protection from foreign oil," he said at one point.

He told about a recent meeting of

your problems are of your own making

INDIVIDUAL DECISIONS must solve our problems, Porter tells API members in a general session. With him at speakers' table are Sen. Mike Monroney, left, and outgoing API Chairman M. J. Rathbone.

tion. Even though the obstacles seem as great as ever, there is much more awareness of the need for facing up to this problem and doing something about it."

Antitrust. "Clarity, not confusion, is the crying need of antitrust enforcement today—and has been for some years."

Oversupply. "It seems that oil men have failed to accept the fact that large percentage increases in demand for petroleum products are past, and that from here on year-to-year gains are likely to be much more moderate. Though we call this an industry problem, it is composed of problems of individual companies and it can only be solved by the individual, independently made decisions of the managements of those companies."

Communication. "We cannot begrudge the extra effort it takes to satisfy the legitimate interest of the public in issues and questions that pertain to our industry and its activities. In a representative government like ours, the public has a right to know essential facts about us, about our activities and motives."

Percentage depletion. "Experts disagree on how strong an attack we can expect against percentage depletion at the next congessional session—whether or not 1962 will be a showdown year. But everyone concedes that the assault on depletion is gathering force."

quit running to Washington for help

the Independent Petroleum Association at which a message from Interior Secretary Udall was read. In it Udall said it was the intention of the federal Government to strengthen the oil-import program.

"This announcement was met with applause," Kelly said, "but later the IPAA resolutions committee voted out, and the meeting adopted, a resolution which condemned the invasion of the Government into activities of the petroleum industry."

At another point of his speech, Kelly said bluntly: "The industry itself must take the major responsibility for our present difficulties.

"In an industry which has available to it perhaps the best and most current basic data of any in the world, you have ignored the handwriting on the wall and gone on your merry way."

"You have sold no more product than you would have sold under more realistic production and throughput schedules, but you have received a great deal less for what has been sold, with a consequent weakening of the entire structure of the industry."

He said this led him to conclude that the time has come for the industry to take a very long and hard look at its own attitudes and practices.

He mentioned, for one, "the time-honored conservation practices of some of the states."

He quoted a Journal editorial which had said that what is needed to cure many of the ills of the industry is for each major company to feel some social responsibility and to stop doing things that are bad for the industry as a whole.

"This is a good prescription," Kelly said.

FIRST PRESS CONFERENCE was held by McCollum immediately after his election. With him is William A. Dennison, director of API's department of statistics.

"Let's base our decisions on economics"

That's the suggestion of API's new chairman, Continental's Leonard McCollum. His advice: before you act, consider what will happen if everyone does the thing you plan to do. With reason, he says, 1962 can be a better year.

L. F. McCOLLUM, new board chairman of API, feels the industry has reason to be optimistic—if it applies reason to its operations.

McCollum, elected last week to succeed M. J. Rathbone as API chairman, notes there has been a recent upswing in industry operations, and he looks for this to continue through the remainder of the year.

Whether this upswing will continue into 1962 depends to a considerable extent, the way McCollum sees it, on how individual members face the problems confronting the industry.

The new API chairman has definite views on the nature of these problems, and he has some specific ideas on how they should be approached.

The big hurdle. To McCollum, the biggest problem of them all is "the glut of excesses."

This includes excess production, abetted by the drilling of needless development wells.

It includes excess refining, complicated further by plans for addition of another 200,000 bbl. daily capacity during the coming year.

And it includes excess inventories, which lead to chaos in the market place.

These excesses create depressed conditions and, over the long haul, could create a shortage of capital, of dividends, and of wages. Should this happen, the industry would indeed be in trouble.

A possible solution. McCollum feels strongly that the threat of the glut of excesses can be met if each company manager were to apply a simple test to his company's plan for the upcoming year.

The test: each manager, in shaping his company's course, should pause long enough to determine what the result would be if every other manager were to do the same thing.

If, for instance, he is planning on increasing product output by 5% in 1962 despite forecasts that demand will increase by only about 2%, he should be aware of what will happen to the market if everyone else makes a similar move.

It wouldn't take long, McCollum believes, for this type of approach to yield results. After all, he points out, if present refinery runs were continued at the present level for the remainder of the year, one-third of the excess products stocks would be used up by the start of the new year.

And, if refinery runs in 1961 had been maintained at 1960 levels, there would be no product surplus to plague us now.

In effect, what McCollum is urging is this: make economic decisions instead of operational decisions.

He urges, too, that a decision affecting one segment of the industry be taken with the other segment in mind.

"One can't have all the profits without creating problems for all," he says.

"If we don't look at the over-all picture but, instead practice the law of the jungle, then the person who is badly hurt is going to try to hit back, perhaps going to Washington for help."

Other views. McCollum, who obviously has looked closely at a wide range of industry problems and practices, willingly expresses his views because he is convinced that industry people should speak up on key issues.

Here are some of the replies he made to questions put before him in Chicago:

In world trade, the President of the United States should be given broad authority to adjust trade agreements to stimulate the flow of goods throughout the world.

Concerning Russia, it will require government-industry cooperation to enable the free world to meet the soviet oil challenge.

On imports, controls must be kept tied to national security needs, and imports from Canada should be permitted as long as there is no "flood" of crude from that country.

McCollum the man. There's an old saying that if you want a job done, go to the busy man. The API seems to have used that approach in selecting McCollum to be its chairman.

He is president of Continental Oil Co., having been chosen for that job in 1947.

He started, after graduating from the University of Texas in 1925, as a scout and geologist with Humble Oil & Refining Co. He was with Humble 9 years before being transferred to another Jersey affiliate, Carter Oil Co. There he rose to the presidency before being sent to New York as assistant coordinator of all Standard Oil Co. (N.J.) production activities. He became coordinator the following year and held that post until he accepted the presidency of Continental.

McCollum currently is chairman of the Export Expansion Committee of the U. S. Department of Commerce and is vice chairman of the department's Business Advisory Council.

He is a member of a wide variety of associations and professional groups.

Despite these many irons in the fire, it is evident that McCollum plans to be extremely busy as API chairman.

Those who know him well are confident that McCollum will help provide the institute and the industry with vigorous leadership.

Economic outlook good

Most economists expect the present recovery to continue through 1962 and into 1963, NICB official tells API.

DEMAND will be buoyed by a sustained but moderate growth in the economy throughout next year and possibly well into 1963.

This is the prospect offered by Martin R. Gainsbrugh, chief economist of the National Industrial Conference Board. But there are two important "ifs":

—IF there are no excessive wage increases.

—IF international concern over the strength of the dollar does not end the current recovery earlier than expected.

Martin R. Gainsbrugh
. . . sees steady economic growth.

Divergent views. There are three schools of thought among professional forecasters as to the shape of next year's business curve.

The first is that the U. S. is in for a vigorous recovery of almost boom proportions, at a rate much sharper than in previous postwar cycles. This view, held principally within the Government, has not been supported thus far by statistics and is becoming less prevalent.

The second—and, Gainsbrugh says, the majority viewpoint—holds that the present recovery will be moderate and will persist at least through 1962.

The third view, well in the minority, is that the present rise in the economy will give way to recession before mid-1962. This is held mainly by organized-labor analysts.

Majority view. Gainsbrugh subscribes to the forecast which he says is being offered by most business economists. "Further moderate recovery in the months immediately ahead, with the strong possibility of expansion being sustained not only throughout all of next year but well into 1963."

Here are the reasons:

Almost 9 months of recovery have been completed with far less strain upon the nation's productive resources and labor force than in any previous period since World War II. Thus, little pressure has been exerted upon the price structure by shortages.

Consumer spending is expected to continue to improve moderately. Automobile sales in 1962 are likely to be well above 1961.

Home building will continue to increase. So will spending for services.

Continued expansion in outlays for capital goods seems likely, although the rise thus far is significantly less than in earlier recoveries. Given more liberal depreciation by Congress, industry would be greatly stimulated by purchases of capital goods.

Oil spending rises. A survey by NICB shows that since the end of the capital-appropriations slowdown in the third quarter of 1960, plant and equipment funds budgeted by the oil industry have increased one-fifth.

Other nondurable goods industries raised capital appropriations by about 4%. But the 9-month increase by the oils was reported at 21%. This is higher than in two previous recovery periods—18% in 1958-59 and 15% in 1953-54.

Let's team up

Sen. Mike Monroney urges a Government-industry partnership. Tax policy, diplomacy, and foreign aid should be used to thwart Reds.

RUSSIA's economic war on the West will be won or lost by its ambitious oil-export program, Sen. A. S. (Mike) Monroney told the API last week.

And he proposed a bold government-industry "partnership" using tax policy, diplomacy, and foreign aid to blunt the soviet oil offensive.

Russia's cut-rate oil, the Oklahoma senator said, is a weapon to gain three objectives: goods for industrial development, disruption of the West, and dependence on the USSR for oil supplies and markets for the nations who buy soviet oil.

Therefore, he declared, it is a problem that is not industry's alone. It is of equal concern to the U. S. Government and the entire free world.

Government partner. Monroney called for an all-out national and international effort to counter Russia's war on the West in the field of trade.

"Diplomacy must be marshalled in support of American oil companies," he said. "Tax policy must give every possible assistance to American companies in meeting soviet prices. We are spending $48 billion a year for the hardware and logistics of military war.

"We must be prepared to spend substantial amounts for oil and oil markets which are the hardware and logistics of economic war. The resources of the foreign assistance program—grants, loans, credits, guarantees—must be organized to support that war."

He further advocated suspending laws which interfere with the effective conduct of the war. Presumably this includes antitrust laws which now bar any concerted industry action.

Why soviet exports cause trouble

The following tactics outlined by Monroney show why industry, alone, can't cope with Russia's oil offensive.

"THE first is to seek maximum sales to Japan and the industrial countries of western Europe in return for machinery, steel, and hard currencies. These countries are looking for markets and bargains.

"The soviets take advantage of their need to expand exports and offer them a cut-rate price.

"Japan is offered soviet crude at $1 per barrel delivered at the Black Sea, or $2 delivered in Japan. The western price is $1.80 at the Persian Gulf, or $2.80 delivered in Japan.

"Finland is sold soviet crude delivered at $2.39 per barrel, Iranian crude at $3.33. Sweden paid the soviets $3.68 for kerosine which costs $4.51 from the Netherlands. West Germany paid the soviets $3.48 for light fuel oil which cost $4.50 from Great Britain.

"After maximum sales in hard-currency markets, the soviets resort to barter of oil for food, fiber, and raw materials from underdeveloped countries . . . least able to resist soviet techniques.

"The soviets, selling crude to Italy delivered at Italian ports for $1.37 per barrel, against a western price of $2.17 f.o.b. eastern Mediterranean, have now concluded with Italy a $200-million barter deal in which they will get 40-in. steel pipe.

"It will build a 2,800-mile pipeline delivering 1,000,000 bbl. a day from the Urals to western Russia. The soviets will supply 20% of Italy's total oil needs for 5 years, and petroleum products extracted from $1.37 soviet crude in Italy will be distributed throughout the Common Market as tariff-privileged Italian products."

to balk Russian oil offensive

Curbing soviet oil. To create the "conditions for victory," Monroney proposed a five-point counter-offensive:

1. Seek our natural allies in the economic war. "All of the nations of the West, whether oil producers or not, must be made to understand the nature and purposes of the soviet offensive, for every aspect of our strategy will require the cooperation of other nations."

2. Compete with the soviets in finding and developing reserves. "We must be prepared to search for and develop oil in countries which now import it . . . We must seek the maximum development of our domestic reserves, regardless of our comparative cost, and retain or institute every incentive which will contribute to that end."

3. Compete in price. "The Russians are offering oil today on the Black Sea for $1.10 per barrel . . . The average cost, without profit, of Middle East oil laid down on the Mediterranean is about $1.40 per barrel, but 73 cents of that cost is the royalty paid to the sovereign.

"Other taxes contribute to the total. There are aspects of cost that we can do something about, if the producing countries can be made to understand the nature of this struggle."

4. Compete in providing markets for basic commodities from underdeveloped countries. "Just as in the case of oil, we cannot permit unrestricted entry into the American market for products already in surplus.

"But we can devise international price-stabilization agreements which will yield these countries comparable income from reduced production of commodities in surplus." This would eliminate dependence on soviet markets and force the soviets to pay world prices.

5. Curb the flow of Western equipment and technology which breaks bottlenecks in the soviet oil industry, establish a tanker boycott of Russian oil or raise charter rates.

Steel may go up again in '62

New pressure on prices is expected when steel's wage contracts expire in June.

STEEL companies are feeling the need to raise prices to relieve their own cost-price squeeze.

The pressure to boost prices will reach a peak next summer after labor contracts expire June 30, 1962, presaging a new wage increase.

The oil industry has shifted $100 million in oil-country pipe-inventory investment back to steel producers during the past 2 years, according to Allison R. Maxwell, Jr., president of Pittsburgh Steel Co.

As a result of this cost-cutting drive, it is the steel companies whose cash is tied up. And this burden may prove costly both to the steel industry and to the oil companies who are enjoying the savings, Maxwell warned. The effect will depend on two factors:

The ability of oil and steel companies to reduce wide demand fluctuations and gear production more closely to actual consumption.

Joint success in arriving at "a more consistent, equitable, and mutually beneficial distribution of the financial burdens in maintaining stocks."

"Our need for capital expenditures to provide lasting long-range returns in cost reduction is equally as urgent as yours," Maxwell said. "Whether our cost cutting can secure enough relief to accomplish this without price adjustments is an open question."

The steel executive cautioned that inadequate prices for oil-country goods would soon hurt oil operators by retarding capital investment for new steel-producing facilities.

"As a matter of economic necessity," he said, "the steel industry must invest its limited resources in the most rewarding product lines."

Rathbone says government action against

Free nations are talking about joint action to battle growing soviet exports. And Rathbone says this is necessary approach. But on the domestic front, Government pressures are "disturbing."

IT WILL take joint action by free-world governments to counteract the threat of soviet oil, M. J. Rathbone, retiring API chairman, said during a press conference in Chicago last week.

Later, in an address before a general session of the API, Rathbone covered a wide range of industry problems but put stress on the point that the industry is still one with a great growth potential.

Regarding the soviet oil move, Rathbone told reporters that action at government level is necessary because an individual company, acting alone, can not parry the thrusts of the soviets.

He said there has been considerable "conversation" on the problem at intergovernmental levels, but indicated that few, if any, concrete steps have been taken yet. However, he said, "I think we can expect something to come out of these discussions."

He estimated that soviet-bloc oil exports to the free world will average about 600,000 bbl. daily this year—up about 45% over the 1960 average—and that the total will be 1 million barrels daily by 1965.

About two-thirds of the soviet exports are going to Europe, Rathbone reported, and of total shipments about 55% is crude oil and 45% products.

Regarding the industry's future, Rathbone told his API audience that there are some people in and out of the industry who feel that oil hit its zenith sometime after World War II.

"We have been accused of no longer being a growth industry," he said. "I don't see it this way. I think we are in a period of changes, yes, but the history of our industry is one of change."

Problems. Discussing problems facing the industry, he listed as one of the major ones the task of "finding just where we fit into the complex international picture."

SOVIET THREAT is discussed by Rathbone in a press conference. At right: API President Frank Porter.

"I am concerned with what seems to me to be a growing tendency of the American oil industry to think in isolationist terms which cannot, in the long run, be good for us as an important part of a vital worldwide industry," he said.

At home, Rathbone said, postwar years "have brought disturbing Government pressures to bear on some of the most important features of our business." He cited as examples controls on natural gas, increasing gasoline taxes, proposals of marketing divorcement, and periodic moves to reduce or eliminate oil's percentage depletion.

"Another set of problems today are posed by the fact that we are long on capacity in almost every phase of our business," he said.

The way he sees it, if new markets for oil products are to be found to use this increasing capacity, the industry itself is going to have to find those markets rather than waiting for them to develop on their own.

"This is an area which calls for imagination plus a lot of hard work."

He also prodded the industry to act boldly in moving ahead to face new challenges.

"In an industry which has always prided itself on being one where inventiveness, risk-taking, and trail-blazing were its main characteristics, we need more of these qualities," he said. "They are not quite as prominent as they used to be."

Rathbone aired his views on other industry-related topics during an hour-long meeting with the press. These included:

Stocks. Product stocks, which are now at about the same level as a year ago, are "ample" but are not necessarily excessive.

Crude-oil inventories are about 7% above last year, and tend to be on the high side but below what the level has been at times in the past.

U. S. demand. Over-all demand has been running about 1% above last year, somewhat lower than what had been forecast at the start of the year.

Demand in District 5 is running

Russia needed

4.3% ahead of last year, but in Districts 1-4 the increase thus far has been only 0.8%.

An increase of about 3% in U. S. demand is expected next year, and increases of between 2% and 3% each year for the next several years appear likely.

In barrels daily, this growth will amount to some 250,000 bbl. a day.

Brightest spots in the demand picture are specialties and jet fuel, which will grow faster than the average. Motor gasoline will be about average, while other products will probably sag below the average.

Demand abroad. Outside the U. S., demand has been running about 11% ahead of last year, including gains of around 12% to 14% in Europe and the Far East.

For next year, the outlook is for an average increase of about 7%. and the long-range outlook is that gains of from 5% to 7% will be made annually.

Earnings. Third-quarter earnings have been "a bit of a disappointment." The average of 24 companies shows earnings down 2% from the third quarter of 1960. For the first 9 months, however, earnings for these companies were up about 7%.

Return on invested capital, probably around 10% or slightly less, "is still low for this type of industry."

Import controls. Continued restrictions on crude oil and all products except heavy fuel oil seem necessary. The present level is "reasonably good—not too far out of line either way."

Marketing. Cut-throat price wars and chaotic conditions might eventually lead to government controls. "If enough people think the oil industry is unable to run its business in a reasonable and proper manner, it could lead to regulation."

Increasing demand. There has been a lot of talk and some concentrated effort recently to increase demand for oil products. Examples: research on fuel cells, increased travel promotion, research on a cheap tractor for use in underdeveloped areas, and "substantial" efforts to improve oil-burning equipment for home heating.

AFTER HIS TALK Rathbone listens attentively to John M. Kelly, assistant secretary of Interior. Kelly told the oil men bluntly they should quit running to Washington for help in solving their problems. It's hardly proper, he suggested, to welcome governmental interference when it furthers your personal interests but to complain about it when it doesn't.

CERTIFICATE OF APPRECIATION is presented to Maynard I. Landa, of Cities Service, for his work in the API statistics program. Landa's award was one of 26 presented in eight API divisions or departments during the annual meeting in Chicago. Making presentation is C. V. Horkey, statistics committee chairman.

Needed: wider spacing to cut costs

Producers could cut their costs 20 cents a barrel if state agencies would change regulations to eliminate drilling unnecessary wells, Lyon Terry says.

PRODUCERS could save half a billion dollars a year—or 20 cents a barrel—if the states would revise their spacing and allowable formulas to discourage the drilling of unnecessary wells.

The dollars-and-cents benefits of wider well spacing were outlined to the production session of API by Lyon F. Terry, associate of Lehman Brothers, New York.

"The American oil-producing industry is in a battle royal with more cheaply-produced oil in foreign fields," said Terry. "To compete, we need to cut our costs.

"The squeeze is on—between the constant price of the crude produced and the increasing cost of replacing it. The spread between the price of crude and the cost of finding and producing it has dropped from $1.70 per barrel to 35 cents since 1948.

"There are only three things to do about it: increase the income, decrease the expenses, or prepare to go out of business.

"The industry has already done a good job of trimming its sails. There remains a major opportunity for reducing the number of development wells drilled each year on properties already proved, by eliminating those wells not actually required for producing and recovering the underlying reserves."

Lyon F. Terry . . . "The squeeze is on . . ."

Many states are responsible, through regulations that encourage unnecessary drilling by compelling an operator to drill for an allowable, Terry said.

Some examples. Sample calculations presented by Terry showed that under present Texas regulations the operator of a 40-acre lease with a 6,000-ft. producing zone would have a 10-year payout of only $116,000 by drilling one well, but a payout of $180,000 by drilling two wells.

However, under a 40-acre spacing pattern and allowables based on acreage, his 10-year payout would

LARGE GROUP of pipeliners sharing this table at the annual Pipe Liners Club dinner included, left to right, G. L. Macuila and H. T. Chilton, Service Pipe Line Co.; C. C. Keane, Great Lakes Pipe Line Co.; W. H. Wallace, Phillips Pipe Line Co.; Paul Reed, The Oil and Gas Journal; Robert E. Thomas, Mid-America Pipeline Co.; Roger Norris, Koppers Co., Inc.; and Sam Jackson, American Oil Co.

Attendance down

REGISTRATION at the forty-first annual API meeting in Chicago last week declined by 340 from the 1960 meeting to a total of 5,964 as of Wednesday noon.

The 1961 registration compares with 6,304 a year ago and is well below the all-time record of more than 6,500.

be $224,000, or 24% higher than on 20-acre spacing—without increasing the total allowable for the field or the state.

In East Texas field, which already contained almost 28,000 wells on 131,000 arces prior to 1945, an additional 2,200 wells have been drilled. Terry said this field could have been drained efficiently by no more than 1,000 wells, and there is no question but that the 2,200 wells completed since 1945 were drilled only to earn additional allowables.

Some evidence. "Within the last 10 years," Terry said, "the number of producing days in Texas has declined from 278 in 1951 to probably 100 in 1961. During the same period, total production for the state has decreased less than 10%. The effect of unnecessary drilling has been to divide the same amount of production among a greater number of wells, the majority of which serve no useful purpose.

"Concurrently, with the drilling of these unnecessary wells, total crude-oil producing capacity in the United States in excess of actual production has increased in the same 10 years from only 900,000 bbl. per day to the present figure of more than 3.5 million barrels per day."

Using an estimate that roughly $2.5 billion per year is spent in drilling development wells, Terry figured that by eliminating 20% of development wells the industry could save $500 million per year.

"The solution calls for action by the state commissions with the support and insistence of the industry. Let's be frank about it—small-tract owners don't like wide spacing. But they can be equitably protected as to correlaitve rights by pooling arrangements or special allocation.

Ikard makes first appearance before API

FRANK IKARD, who has resigned from Congress effective December 15 to join API, is shown here as he was introduced for the first time as a member of the API team.

The Texas congressman had appeared on the platform at an earlier annual meeting, but then it was as a principal speaker.

Ikard last week gained an unusual distinction: he was reelected executive vice president before actually going to work for the Institute. Ikard was elected to the job earlier this year, but had to be reelected by the directors at the annual meeting.

Sell comfort, Fraser tells fuel-oil men

ALL the heating customer wants is a complete, worry-free, and comfortable service.

This means that the fuel-oil industry is selling more than No. 2 heating oil. It's selling a way of comfortable living.

That's the approach American Oil Co. has taken in the last 3 years in offering customers its "complete comfort plan."

A. V. Fraser of American Oil told the API fuel-oil committee that his company has realized a substantial increase in profits from fuel-oil sales since it started the plan. Fraser said the plan encompasses these points:

A quality product that burns easily and clean.

Payment on a budget plan of 9 or 12 months.

A stay-full service under which the supplier is responsible for seeing that the customer never runs out of fuel.

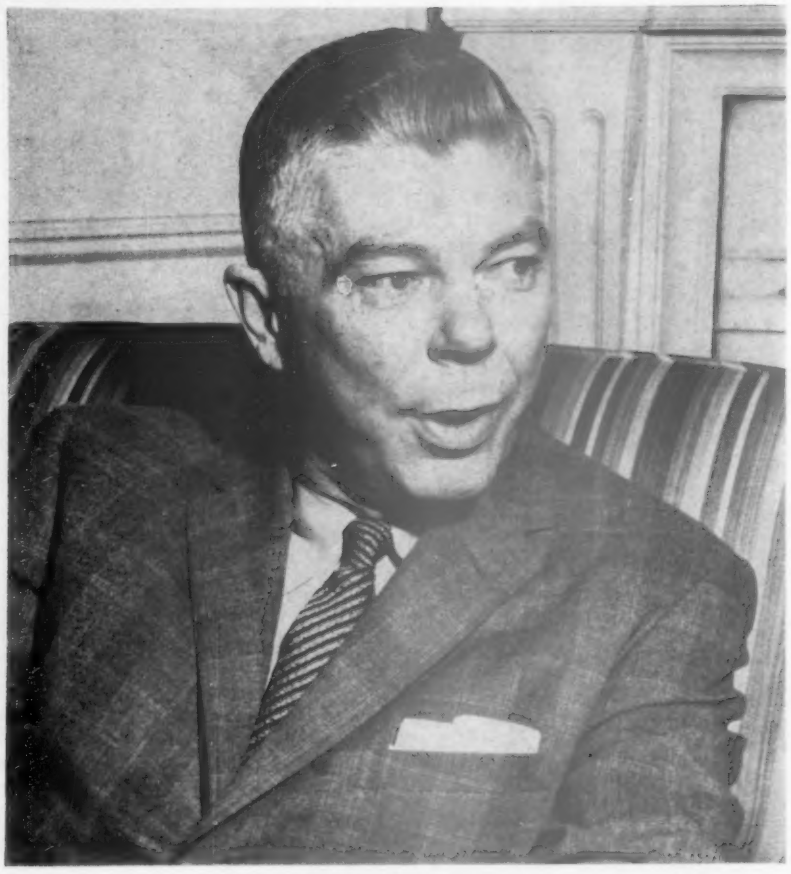
Summer-fill program under which the customer's tank is filled in the summer and he pays in the winter but is guaranteed against a price increase.

Low-cost burner service either by an outside contractor or company employes.

American supports this plan with institutional advertising of fuel oil.

Fraser, from his experience with the plan, observed that the home-heating market is getting larger. Fuel oil also can be sold in competition with other fuels but not on a product basis—only a complete heating-comfort basis.

And just as encouraging he added: "A profit can be made from this business."



Gulf's Del Brockett

New API vice president

will succeed Henderson Supplee as head of institute's Division of Transportation. He's president of Gulf.

THE API elected one new division head at its forty-first annual meeting. He is E. D. Brockett, president of Gulf Oil Corp., new vice president of the Division of Transportation.

Brockett succeeds Henderson Supplee, Jr., president of Atlantic Refining Co., who served the customary 2 years in the office.

API's new transportation chief is a production man. But as president of a large international company, he operates and uses a vast world-wide system encompassing every major means of transportation.

Transportation problems. Brockett assumes the industry post at a time when pipelines and other private transport systems are stronger than ever.

But industry spokesman are warning that for-hire carriers—especially rail and water—are losing out to private systems to the extent that their value to industry may be impaired.

The need for strong private and for-hire carriers was stressed in major transportation speeches at the API by Albert L. Nickerson, chairman of Socony Mobil Oil Co., Inc., (see Page 135), and George Baker, president of the Transportation Association of America.

Brockett's career. The man who now becomes concerned with these problems has spent his 27 years in the oil business entirely with Gulf Oil Corp. and affiliates.

He came up through the ranks in the finest oil-field tradition, starting as a roustabout at McElroy, Tex., following graduation from Texas A&M College. He was a production engineer at Odessa, Tex., for 4 years before being called to military service as a first lieutenant in 1940.

Brockett served in the Pacific theater and was discharged as a colonel in 1945. He then returned to Gulf as assistant chief engineer at the Fort Worth, Tex., office.

Brockett held other positions in Fort Worth and then in the general office in Pittsburgh, prior to broadening his experience in international operations.

He was successively assistant to the president of Mene Grande Oil Co., manager of production in eastern Venezuela for Meneg, vice president of Gulf in charge of the Houston production division, coordinator of world-wide production, and president of British American Oil Co., Ltd.

On January 1, 1960, he returned to Gulf as executive vice president, then was elected a director and a member of the executive committee. On October 28 of that year, he was elected president and vice chairman of the executive committee.

New API officers

THREE new officers were elected at the forty-first annual API meeting.

The new chairman of the board is L. F. McCollum, president of Continental Oil Co., Houston (p. 120). Frank N. Ikard of Washington, D. C., was named executive vice president (p. 127), and E. D. Brockett (left), president of Gulf Oil Corp. was named the new API vice president for transportation. All other divisional vice presidents were reelected for a second year.

New directors include: Warren J. Hancock, Mule Creek Oil Co., Billings, Mont.; S. J. Iverson, Iverson Supply Co., Fort Worth; J. R. McWilliams, Republic Supply Co., Oklahoma City; Otto N. Miller, Standard Oil Co. of California, San Francisco; Fred Moore, Mobil Oil Co., New York; Reese Taylor and Dudley Tower, Union Oil Co., of California, Los Angeles; and Richard E. White, Mission Manufacturing Co., Houston.

New honorary directors are Warwick Downing of Denver, and T. S Petersen of San Francisco.

A quick look at petrochemicals

Production
(Billion lb.)

Year	All chemicals	Petro-chemicals	% of total
1955	135	32	24
1956	143	35	25
1957	148	38	26
1958	165	42	25
1959	180	50	28
1960	190	60	32
1965	265	100	38
1970	330	135	41

Value
($ billions)

Year	All chemicals	Petro-chemicals	% of total
1955	7.2	3.7	51
1956	7.8	4.2	54
1957	8.7	4.4	51
1958	8.4	5.0	59
1959	9.8	5.7	58
1960	10.4	6.4	61
1965	17.2	10.5	61
1970	24.0	15.3	64

Capital Expenditures
($ billions)

Year	Petroleum refining	Petro-chemicals
1955	0.8	0.5
1956	0.9	0.7
1957	0.9	0.9
1958	0.6	0.7
1959	0.5	0.7
1960	0.5	0.7
1961	0.6	0.8
1970	0.9	1.4

Petrochemicals to star in '60's

By 1970 petrochemical production may be equal to 41% of all chemicals on a tonnage basis.

PETROCHEMICALS will continue to outstrip other chemicals and other petroleum products in growth during the 1960's.

They now take a bigger share of domestic budgets than refining, with an $800 million capital investment this year alone. Output is expected to double by 1970.

These projections were presented before the Division of Refining by Henry G. McGrath and Luther R. Hill of M. W. Kellogg Co., New York.

Their study anticipates that petrochemicals will account for 41% of all chemicals on a tonnage basis by 1970.

In dollar value petrochemicals show even greater promise. They have exceeded all other basic and intermediate chemicals for the past 6 years in this respect and by 1970 will represent 64% of all returns on chemicals.

Capital investment in petrochemicals is now estimated to be between $6 and $7 billion, representing nearly 60% of assets in the entire chemical industry. Twenty years ago it amounted to only $315 million. By 1970 it should reach about $12 billion.

Petrochemicals have attracted more capital than refining since 1958, and the present situation is expected to continue indefinitely.

Some oil companies were in the petrochemical field early. In recent years the oil industry's participation has broadened and today it is playing a significant part in petrochemical growth.

Basic knowledge in manufacturing and marketing are being applied to this attractive area for investment. Companies producing and processing oil and natural gas show an enormous potential for mass production of the primary chemical building blocks. They will therefore continue to be in the picture to an ever increasing extent, concluded McGrath and Hill.

Rather than going their separate ways, the petroleum refining and chemical industries will tend to overlap more and more in the future. Refining will integrate forward to finished products for greater profit margins. At the same time, chemical companies will continue to integrate backward to assure lower cost supplies of petroleum and natural gas.

Henry G. McGrath
... refiners will make finished products.

Dennis named head of Transportation Club

J. P. Dennis, of Texaco Inc., was elected president of the Transportation Club of the Petroleum Industry last week in Chicago.

Other new officers are R. L. Andreas, American Oil Co., first vice president; Robert Maguire, Atlantic Refining Co., second vice president; C. H. Wager, Shell Oil Co., secretary; and A. G. Anderson, Socony Mobil Oil Co., treasurer.

Directors include W. D. Ohle, Sinclair Refining Co., chairman; J. M. Whelan, retired, vice chairman; R. R. Hooper, Consolidated Freightways, Inc., honorary secretary-treasurer; H. B. Brown, Socony Mobil; J. A. Roberts, of P. B. Mutrie Motor Transport, Inc.; L. A. Christiansen, Sun Oil Co.; and W. M. Johnson, of Rogers Cartage Co.

Foreign agreements may be deceptive

Recent concessions may not be so profitable as some new producing countries think, says Aramco economist. Broader participation in company operations can be a liability. Huge bonuses could make it hard to sell oil at a profit.

SOME COUNTRIES may be kidding themselves about new concession agreements which appear to offer them a bigger profit.

Their agreements may actually work to their disadvantage. And some governments involved may be re-examining them in light of the realities of world oil operations.

First, it doesn't do any good to develop production if you can't sell it. And a stake in operations down to the gasoline pump can be a liability as well as an asset.

These possibilities were raised by Joseph H. Ellender, chief economist of Arabian American Oil Co., in an API address in which he defended the results of older concession operators.

"The new generation contends the older oil-concession agreements represent a forfeiture of rights by an older and less sophisticated generation," he said. Actually, he added, no concession agreement or national petroleum law has remained static.

At the end of 1958 Venezuela increased its tax law retroactive to the first of that year, Ellender pointed out. Libya's recently revised petroleum law now decrees that existing concession holders will have to subject themselves to the new law to obtain more acreage in the future.

Recent agreements. The Japanese offshore Neutral Zone concession, Ellender noted, has been praised by host countries as ensuring "the best of all possible worlds."

It provides participation in management, participation in integrated profits world-wide, control over the sales price, and financial participation in the company.

The newest approach to concessions, the Aramco economist said, is open bidding for all or parts of an area, with some dictation of minimum acceptable terms.

But the experience of some newcomers to foreign operations who have developed large production potentials could, in Ellender's opinion, serve to question the wisdom of that approach. For example:

Joseph H. Ellender

". . . don't underestimate risks."

"One operator is experiencing considerable difficulty selling his oil. Another is having difficulty with his government partner. Still another has found some very handsome 'shows' but no commercial production. Who could ever imagine that a 1,500-bbl.-per-day discovery well would be considered noncommercial, unable to pay out the large original bonuses and investment in facilities?"

What the producing countries really need most from the companies — capital, management and technical know-how, and better assurance of a market for their oil— are, in Ellender's view, largely neutralized in many recent agreements. But the modern trend is being examined critically.

"For instance," he said, "Kuwait last year concluded an offshore deal almost wholly on the basis that Shell Oil Co. was the most likely operator to assure a market for any oil discovered.

"Also, its renegotiated agreement with Aminoil gives full consideration to the difficulties of an independent nonintegrated oil company in trying to find markets for its oil."

Results of old concessions. Producing countries have fared very well under old agreements, Ellender said, and cited this record in support of them:

"The six older concession operators are producing and selling 5½ million barrels of oil a day and are paying the governments over $1⅓ billion a year, or at the rate of better than 70 cents a barrel for oil that actually sells for something less than the average posted price of $1.75.

"They feed another $300 million into the local economies through payrolls, local purchasing, and various social investments. They employ tens of thousands of nationals and have proved or indicated a volume of oil reserves that will assure these governments continuing revenues from oil for perhaps a hundred years or more."

Foreign operating pitfalls. Ellender praised the intelligence and integrity of "our Saudi Arab friends and associates," but he cautioned would-be foreign operators against underestimating the political and other risks abroad.

Buildings in Saudi Arabia, for example, cost 2½ times as much as in the U. S., and heavy equipment delivered on the site nearly two times as much.

The investment in non-oil operations can be heavy. Aramco assumed the role of buyer, distributor,

and sometimes even manufacturer of the personal needs of its 13,000 or more employes.

Investment can become very large before the operation begins to produce revenue. The Japanese in the Neutral Zone spent $70 million before commercial shipments could be made. And they hit pay sand with their first well.

There are costly failures — $36 million has been spent recently in the western desert of Egypt without success.

Social responsibilities are heavy. Aramco industrial-training centers have turned out nearly 150,000 skilled mechanics and clerical workers. Some $13 million was spent last year on training schools and donations to charities and institutions.

Aramco operates a TV station. It provides free schools for children of employes and free petroleum products to the government.

Political problems abound, the most persistent being pressure to change existing agreements and petroleum laws.

Swidler repeats: regulation IS necessary

API speech indicates he's strongly opposed to any bill aimed at freeing producers. But poor regulation, he agrees, could make matters much worse.

IN CASE anyone had any doubts about his views, Federal Power Commission Chairman Joseph C. Swidler made it clear last week he believes that regulation of natural-gas producer sales to interstate pipelines is definitely necessary.

It can be assumed, therefore, that Swidler would stoutly oppose any legislation freeing independent producers from direct control.

"If, as I believe, the major purpose of regulation is to protect the long-run interests of the ultimate consumer, it is essential that supplies be safeguarded and prices stabilized through regulation at the field level," Swidler said in a speech at the API.

He conceded, however, that "misguided or shortsighted regulation could make the situation worse rather than better."

"We have the difficult task of guarding against unjustified increases in the price of gas at the wellhead while at the same time making sure that the price is high enough to insure its availability," he said.

Swidler called on the industry to join in demonstrating to the world that the American system of preserving the incentives of private enterprise within a scheme of regulation in the over-all public interest can do a better job for the people of the U. S. than any other system.

Swidler also mentioned some current steps the commission is taking to cope with regulatory problems:

An emphasis on settlement of cases without going through full formal hearings.

An all-out effort to bring area-price hearings to "an early and meaningful conclusion."

An intention to ease the burden of the small producer, short of outright exemption.

An expectation that the commission will complete within the next few months a review of the zone boundaries used in area-pricing.

(For details on these steps, see the Journal's interview with Swidler in the October 30 issue, p. 104.)

PIPE LINERS CLUB table found these pipeline executives enjoying the annual dinner. From left are Millard K. Neptune, Texas Eastern Transmission Corp.; F. B. Neptune, Phillips Pipe Line Co.; Robert E. Thomas, Mid-America Pipeline Co.; W. H. Sloan, Canadian Hydro Carbons; S. V. Kane and J. A. Hatfield, Plantation Pipe Line Co.

Potter tells of secret task-force work

Statement of principles outlines area of agreement among producers, pipeline companies, and distributors. Most important conclusion, says Potter: gas is a changing industry and must continue to be so.

THE results of 2 years of secret negotiations to frame new legislation for regulating the price of natural gas were revealed to the API by L. T. Potter, president of Lone Star Gas Co., Dallas.

It has been no great secret that a "task force" representing producers, pipelines, and distributors has been meeting quietly in an attempt to reach an agreement on the outlines of a new bill. But all participants have kept mum on what progress, if any, was being made by the group.

Potter lifted the veil of secrecy in an address to the API's Production Section. As last year's president of the American Gas Association, Potter was a member of this task force, which was made up of representatives of API, AGA, Independent Petroleum Association of America, Independent Natural Gas Association of America, and Mid-Continent Oil and Gas Association.

L. T. Potter
. . . understanding, but not unity.

Task group's seven principles

1. THE Natural Gas Act must be amended in the interest of gas consumers as well as the distributors, pipelines, and producers. The amendment must include specific measures for the economic protection of each of these interests.

2. The business of exploring for, finding, producing, and selling natural gas in the field has none of the attributes of a public utility and should be freed from public utility-type regulation.

3. In order to protect consumers, distributors, and pipelines, no future contracts between interstate gas pipelines and gas producers for the purchase and sale of natural gas to be transported in interstate commerce for resale should be valid or effective until the prices therein are approved by the Federal Power Commission. In approving prices for natural gas to be transported in interstate commerce for resale, the commission should consider the provisions of the contract in its entirety including fixed escalations and should apply a standard under which the gas will be treated as a commodity. Producers are entitled to know the prices they will receive for their gas and the duration of their contracts.

4. Any solution of the problems confronting producers and distributors must be carried out in a manner that will not impair the efficient, economic operation of pipelines and will not impede their ability to expand to meet the growing needs of the industry. Any gas produced and sold by pipelines or distributors should be priced in the field at levels consistent with the price level of gas produced and sold at arms length by independent producers.

5. Distributors as well as pipelines are entitled to know their present gas costs as well as those costs which may reasonably be expected to prevail in the future under existing contracts.

6. The realities of the competitive situations with which natural-gas service is variously confronted must be recognized.

7. The natural-gas industry, operating in all three of its segments, must recognize the legitimate and appropriate interest of the ultimate consumer in assuring an adequate and continuing supply of natural gas and acceptable service at reasonable prices, currently and in the future.

Seven principles. The big secret was a "statement of fundamental principles" listing seven points which, the group feels, should be accepted by the entire gas industry and by Congress if there is to be legislation which will permit the gas business to thrive (see box).

In general, these principles are incorporated in the new Harris bill, H.R. 7575, now pending in the House. However, Potter warned that some provisions of this bill as now written go beyond the statement of principles or contradict them.

Publicity is now being given the statement of principles, Potter explained, in hopes that all members of the gas industry will study and accept the agreement hammered out by the task force.

Potter also discussed the area-

pricing approach now being tried by the Federal Power Commission. He said it has much merit, but warned producers not to be led into the trap of accepting "posted prices." This might be all right for present gas sales but it will not provide the incentive for new discoveries, he said.

Background. The most important conclusion of the task force, Potter told API, is that the gas business is a changing one, and that it must be a changing one because "important elements of our present status are intolerable and simply cannot continue indefinitely."

The industry was headed for deep trouble even without the intervention of federal regulation brought about by the 1954 Phillips decision of the Supreme Court, he explained.

The trouble was that each segment of the industry was extremely happy with certain aspects of the rapid expansion of interstate distribution of gas immediately after World War II. Producers loved the expanding demand and rising prices. Pipelines found it easy to promote and build new systems. Distributors thought cheap natural gas was heaven sent to solve their problems.

Then suddenly all three segments became dissatisfied with their prices, their contract obligations, and their growth problems, and all were distressed and disturbed.

"Then," said Potter, "to really put the topping on, federal regulation was placed in the position of being essentially unworkable.

"Here was an industry of three segments, confronted in each of its segments with extremely disappointing developments, coming on the heels of what had been such pleasant actualities and prospects; while to compound the difficulty, the industry was placed in the strait jacket of an unworkable federal regulatory pattern.

"Here was an industry about to 'come unbuckled'; about to fall apart; about to go to war with itself; about to become resolved into three war parties, each mobilized and resolved to protect its position, or improve it. If it could."

So when the task force first began its "peace conference," each segment was determined to find a near-perfect solution for itself without regard for the others. Each was disappointed that things were not so rosy as they once appeared.

The interassociation conferences started out with the hope of achieving "unity" in the gas industry, but this proved impossible, Potter explained. Then the objective became "harmony," but it was soon found that harmony was a mirage. So the three segments decided to try to understand each other's problems, and now the project has been christened the "industry understanding program."

The result is the "statement of principles" which the group believes will, if embodied in legislation, be in the public interest and permit all three segments of the gas industry to live and expand.

Lynch named head of Pipe Liners Club

R. H. Lynch, Atlantic Pipe Line Co. vice president, will head the Pipe Liners Club for 1962.

Lynch was named to succeed Harry Moreland of Great Lakes Pipe Line Co. as president at the group's annual dinner in Chicago.

Other new officers of the club include J. L. Irvin, Gulf Refining Co., vice president, and Oliver Klinger, Pipe Line News, secretary-treasurer.

New members of the membership committee are Phelan H. Hunter, Humble Pipe Line Co., and J. H. Rice, Marathon Pipe Line Co.

Earl Unruh, Sinclair Pipe Line Co., and Charles S. Mitchell, Cities Service Co., were elected to the board of governors.

HIGH HONOR was awarded to J. C. Donnell II, president of Ohio Oil Co. He became the industry's second man to receive the Carl A. Young Memorial Award for meritorious service to the oil industry. Presentation was made by Gage Lund, left, API vice president for production and vice president of Standard Oil Co. of California. The award, created in 1957, was first given to Jake L. Hamon in 1958. Donnell was honored for outstanding service as API production vice president in 1951 and 1952, and as chairman of the API program and budget-review committee from 1954 to 1959.

Says Cram: today's prices won't find

Finding gas is steadily getting tougher, and costs are rising rapidly. Oil can't finance the needed search, so gas prices have to go up, Cram concludes.

A LOT MORE natural gas remains to be found in the United States, but increasingly more effort will be required to find it. This will require a big jump in the wellhead revenue from the sale of gas.

Ira H. Cram, vice president of Continental Oil Co., Houston, told the Petroleum Statistics Section of API that conservative forecasts indicate that to yield the money needed to maintain supplies, the average field price of gas will have to be about 20 cents per M.c.f. during the next 5 years and about 27 cents during the 1966-1970 period. The average 1960 price was 14 cents.

Rising gas prices in recent years have been a tonic to exploration, but not enough to prevent the reserves-production ratio from falling to 20 to 1, which is considered the minimum.

However, the increasing attractiveness of gas as compared with oil has taught the industry ways of searching for gas alone instead of for oil or gas indiscriminately, Cram said.

As a result, 36% of successful exploratory wells and 11% of all producing completions were gas wells in 1960, compared with 20% and 8% respectively in 1950. So at the end of 1960, there were 46% more gas wells and only 29% more oil wells than at the close of 1950.

"Increased revenue gets the job done," Cram observed.

Cram's reasons why gas prices will have to rise still more in the coming years:

1. Discovery difficulties. With the passage of time, increasing effort has been required to find and develop a barrel or cubic foot of hydrocarbons. Wildcat wells are getting deeper. The percentage of dry holes is rising. New discoveries are small fields rather than giants.

The depth of gas wells, in particular, has increased. In 1950 oil wells completed averaged 3,899 ft. and gas wells 3,932 ft. Since then there has been practically no change in the average depth of oil wells completed (3,892 ft. in 1960), but the depth of gas wells completed increased about 40% to 5,498 ft. in 1960.

Ira Cram . . . "Increased revenue gets the job done."

2. Rising costs. In 1939 gas wells cost $4.71 per foot and oil wells $5.92. By 1959 these costs had risen to $18.45 and $13.63 respectively, an increase of 290% for gas-well footage and 130% for oil-well footage. Also, the average cost of drilling a gas well in 1959 was almost double the cost of an oil well—$100,700 vs. $52,000.

In the past 5 years the footage required to find and develop a trillion B.t.u. was 35% greater than in the 1946-1950 period, but unit cash costs increased 83%.

Thus hydrocarbons were 34% harder to find and the cost was 83% higher. During the same period, unit revenue from the wellhead sale of oil and gas increased only 24%.

Specialization on gas. Explorationists are learning how to direct their efforts toward finding gas, and also how to apportion wellhead revenue between oil and gas.

The exploration effort is directly related to total wellhead revenue. In the 1951-1955 period, 56% of this revenue was devoted to exploration, but only 52% in the 1956-1960 period, due to the cost-price squeeze.

There is little prospect that wellhead revenues from oil during the current decade will increase enough to finance the amount of exploration needed to maintain gas reserves

tomorrow's gas

at a 20 to 1 ratio to production.

Therefore, gas will have to contribute a larger share because the needed discoveries won't be made as a byproduct of hunting for oil.

Cram's forecast. How Cram figured that the average field price of gas will have to rise to 20 cents and then to 27 cents is briefed in the accompanying table.

Applying what he said are conservative assumptions to the trends of the past decade, Cram estimated for the coming decade the cost of finding and developing the needed oil and gas.

He then apportioned this expenditure between the wellhead revenues that will have to be obtained from sale of the two products in the volumes which presumably will be produced. The only way to get these revenues is for gas prices to rise to the levels he mentioned.

In arriving at this forecast, Cram made these assumptions:

Unit costs of finding and developing hydrocarbons will increase 7% in each 5-year period.

The industry will allocate 54% of wellhead revenues to finding and developing activities. This will yield gross additions to reserves during 1961-65 of 15.5 billion barrels of oil and 130.2 trillion cubic feet of gas, and during 1966-1970 will add 16.9 billion barrels of oil and 149 trillion cubic feet of gas.

Production will be 13.5 billion barrels of oil and 74 trillion cubic feet of gas during 1961-1965, and 14.5 billion barrels of oil and 89 trillion cubic feet of gas during 1966-1970.

The average price of crude oil will not rise above the 1960 level.

Cram's API paper supplemented his recent testimony before the Federal Power Commission in the Permian basin hearings (p. 148).

Projected revenues vs. expenditures

. . . as seen by Ira Cram

	1951-55	1956-60	1961-65	1966-70
Well-head Revenues				
Oil (billion $)	31.1	37.7	38.9	41.8
Gas (billion $)	3.8	6.9	14.4	23.0
Total	34.9	44.6	53.3	65.0
Oil (%)	89	85	73	65
Gas (%)	11	15	27	35
Oil ($ per barrel)	2.66	2.94	2.88	2.88
Gas ($ per M.c.f.)	0.091	0.122	0.202	0.268
Per trillion B.t.u. produced ($)	292,000	316,000	338,000	361,000
Finding and developing costs				
Total (billion $)	19.6	23.0	28.7	34.6
Per trillion B.t.u. produced	163,000	162,000	182,000	192,000
Per trillion B.t.u. added	103,000	117,000	125,000	134,000
Natural gas as % of total B.t.u. sold	37	42	49	52

Crisis is coming in transportation industry

Nickerson says present trends threaten ability of for-hire carriers to offer efficient, economical service.

COMMON CARRIERS are facing a fight for survival under private ownership and management.

Albert L. Nickerson, board chairman of Socony Mobil Oil Co., said current unfavorable trends are limiting the for-hire carriers' ability to lower costs and improve their service. He addressed a general session of API Transportation Division in Chicago's Palmer House.

This is particularly alarming to the oil industry, Nickerson said, because it may limit the ability of oil men to select the type of transportation that serves them best. He noted that the oil industry has long provided its own transportation but also is a large user of for-hire carriage.

The adverse trends listed by Nickerson included:

Government regulation that is increasing in complexity and stringency.

Discriminatory taxation, particularly involving the railroads.

Cost-price squeeze which has been heavier than usual because of the excess transportation capacity.

Extremely bitter intra-industry battles.

Nickerson said some for-hire carriers strongly feel a solution to their problems is to restrict by legislation the amount of private carriage a company may use. He warned that this kind of tampering with the economics of transportation would not work. It has the same effect as "featherbedding" because the consumer will pay.

"There is plenty of room for both private and for-hire carriage," he said, adding: "There also is a strong and specific need for each."

Nickerson in effect asked oil men to reexamine the economics of their private transportation and urged the for-hire carriers to make a strong effort to reduce their costs. The result could well be more use of for-hire transport by the oil industry.

"I think the oil business is a good business to be in today," Nickerson concluded. "We regard our growth prospect as excellent. If business men in the transportation industry seize this opportunity and use imagination and innovation to outperform us in moving oil cheaply, dependably, and safely, they will deserve and get a bigger piece of this bigger job."

Fuel-oil men optimistic

Acceptance should improve, committee told. Next step: attack legality of subsidies offered by gas, electricity.

THE fuel-oil industry is more unified than ever in a national program to win over builders, apartment and building operators, and home owners to oil-burner equipment.

This was apparent last week when the API fuel-oil committee heard progress reports at its session in Chicago.

The fuel-oil industry can count these accomplishments since last year:

1. **Research** on a large scale has been undertaken both by the API and individual companies to extend the knowledge of fuel mixtures and combustion and to improve burner equipment.

2. **The National** Oil Fuel Institute (NOFI) has been organized and staffed to unify various elements of the industry and direct a hard-hitting educational and promotion campaign.

The outlook: fuel oil in the years ahead should improve its acceptance and competitiveness with gas and electricity in the space-heating market.

Research. The research for the program is being conducted in two separate ways under the guidance of D. W. Locklin, of Battelle Memorial Institute, who is serving as research consultant.

The two approaches: contract research sponsored by API in independent research organizations, and company research independently financed by oil refiners and conducted in their own laboratories.

Seven projects have been assigned to private research groups. Doing the work are Stanford Research Institute, Arthur D. Little, Inc., Rutgers University, Atlantic Research Corp., Armour Research Foundation, and Battelle Memorial Institute.

Their area of work includes: effects of spray droplet size on combustion, new means of fuel atomization and theoretical study of atomization mechanism, vaporization of No. 2 heating oil, air-fuel mixing and recirculation, new ignition systems for oil burners, and air compressors and fuel pumps for small oil burners.

Refiners working on specific burner applications include American Oil Co., California Research Corp., Esso Research & Engineering Co., and Gulf Research & Development Co.

Results of all this research will be reported to a conference scheduled for Chicago in June.

NOFI ready. Glenn Werly, new executive vice president of NOFI, told the Fuel-Oil Committee that his organization will have one basic aim for the present: encourage burner installations.

This work will center around fair treatment for fuel-oil burning systems in building codes and ordinances and around the matter of competitive subsidies for builders installing heating equipment.

Werly said NOFI has put the job of combating subsidies offered by competing fuels as its highest priority job. He declared they create a monopoly situation and added that NOFI plans to test their legality, bring them into the light, and force the utilities to publish them as part of rate structures.

Werly said that the subsidies offered builders by the gas and electrical utilities ranged from $50 to $200 per home. The buyer then is tied to the fuel required by the equipment.

Individual fuel-oil dealers are unable to meet this subsidy issue alone, Werly said. It has become an industry problem. The industry can develop a competitive subsidy program on a national basis, he added. but this gives an air of respectability to the questionable action of competitors.

Werly said NOFI plans to fight the subsidies first on a legal and ethical basis before undertaking competitive subsidies for fuel-oil installations.

CLEAN HEAT was demonstrated to members of API fuel-oil committee by American Oil Co. Chefs toasted marshmallows to a golden brown for visiting oil men. The promotion stresses American's Sta-Clean fuel-oil additive and its burner service which is part of the company's complete worry-free heating service.

Pan Am hits in Persian Gulf

Company's Darius 1 off Iran appears good for 15,000 to 25,000 bbl. daily, at least, and may turn out to be even better. Plans are being formed to have new field in commercial operation by latter part of next year.

PAN AMERICAN has ended a long dry spell in its foreign exploration programs with a major "Middle East" class discovery in Iranian waters of the Persian Gulf.

The Indiana Standard subsidiary has brought in its Darius 1 for at least a 15,000-to-25,000-bbl.-daily well. The exact potential could not be determined immediately because separator facilities on hand at the time of initial tests could handle only 11,000 bbl. daily.

The find is 3 miles south of Kharg Island, where a major new oil export terminal is in operation. Pan Am almost certainly will build its own terminal there if it does not make use of existing facilities on the island.

The well is producing typical 29.5-30°-gravity sour Iranian crude from a Lower Cretaceous formation at about 11,750 ft. Pay consists of 1,000 to 1,200 ft. of fractured and vugular limestone. Bottom-hole pressure is 5,000 to 5,500 psi., and the gas-oil ratio is normal for the well's depth and class.

Southeastern Drilling, which operates Pan Am's two rigs in the 6,000-sq. mile offshore block, drilled the well in 140 days from a fixed platform in 160 ft. of water. The well is under control.

The second rig is currently drilling ahead at 7,000 ft. in Cyrus 1, toward the center of the Persian Gulf, almost due west of the Darius well.

The discovery is near the 3-mile seaward boundary of the consortium's concession over Kharg Island, which was included in the original settlement agreement. The structure extends to the island itself, where the consortium's Iranian Exploration and Producing Co. recently spudded a wildcat on the formation.

Production plans. Pan Am will learn more about the discovery's potential when additional separator facilities arrive within a few days. But the well appears to be good for 10,000 to 20,000 bbl. daily on commercial production.

Plans already are in the mill to start commercial operation of the field by the fourth quarter of 1962. As many wells as can be drilled will be completed by that time on a 1-mile spacing. Gas separation and dehydration equipment will be installed on Kharg. The next test in the area will be a 2-mile stepout.

A market is already available for some of the crude. Indiana Standard earlier this year bit off a portion of the Italian market with the purchase of a 25,000-bbl. refinery at Cremona and 700 service stations in northern and Central Italy.

Pan Am's agreement. Indiana Standard surprised the oil industry 3 years ago by making an agreement with the Iranian Government

which in effect will work out to a 75-25 profit split in favor of Iran.

Under the arrangement, Pan Am and a government company divide interest in the operating company, IPAC. Profits of IPAC will be split first with the government, and then divided again with the government company. Pan Am also paid a $25 million bonus and agreed to spend $82 million on exploration over the first 12 years.

The Darius find was brought in on the fourth attempt on the block. Earlier wells were good for 2,000 bbl. daily, but are considered noncommercial.

Geology. The well marks the first time prolific Lower Cretaceous limestone has been encountered in Iran, either on shore or off. Middle Cretaceous pay zones have been found in ENI's discovery at the head of the Persian Gulf and in the consortium's new 3,500-bbl. Bibi Hakimeh discovery, which lies between the coast and Gach Saran oil field. The bulk of Iran's huge reserves, however, are in the Asmari limestone of Oligo-Miocene.

The nearest Lower Cretaceous limestone production is the Ratawi formation in the Neutral Zone, almost directly across the Persian Gulf from Kharg. Aramco's offshore Safaniya oil field on the opposite side of the gulf produces from Lower Cretaceous sands.

Wild Saharan gas well catches fire

A GAS well in the Sahara Desert blew out and was burning out of control at mid-week.

No. 2 Gassi Touil, 93 miles south of Hassi Messaoud, blew out November 4 because of a break in a joint of surface equipment. It caught fire a week later, and professional fire fighters flew to the scene.

The wild well was flowing an estimated 35,000 M.c.f.d.

The well is owned by the Copefa-Phillips Petroleum-Omnirex group, with Copefa as operator. Gassi Touil is one of three gas structures the group has found on Hassi Trouareg acreage. They have requested development rights in the three fields.

Five producers and one dry hole have been drilled in the three fields. Gassi Trouil 2 had tapped pay at 4,363 ft.

Line of attack on Permian producers hinted

FPC examiner's hearing gives clues about how distributors will testify next month. They'll probably challenge producer estimates of needs, fair prices.

THE pattern of attack on producer proposals in the Permian basin hearing is beginning to take shape.

This was indicated by questions asked of producer witnesses at the start of a hearing last week before a Federal Power Commission hearing examiner.

The producer group had presented the written testimony of 14 experts at an October 11 session. Last week, cross-examination of these witnesses began.

When that is concluded, the next stage will be the December 14 presentation of testimony by the opposition — distributor groups, state utility commissions, and others.

At the outset of the cross-examination last week, it appeared evident that the distributor group will press producer witnesses for specific data, including individual company information.

The producers have sought to steer away from this on the ground that such an approach would lead right back to the old company-by-company procedure.

Basically, what the producers want to show is how much gas is needed to assure adequate supplies to consumers and what price will be required in each area to provide the incentive to producers to find that much gas.

The distributor group apparently plans to contend that both the estimated needs and the necessary prices proposed by producers are too high.

For instance, one early move at last week's hearing was to demand supporting evidence for the joint drilling-cost survey which is now made annually by American Petroleum Institute, Independent Petroleum Association of America, and the Mid-Continent Oil and Gas Association.

The distributors did not charge that the survey findings and figures were wrong. They simply said they could not accept them unless they were given access to the materials on which the figures were based.

They wanted to know the names of the companies surveyed and how many of those are producers in the Permian basin.

Producers contended that this was unnecessary because the joint survey had long ago been established as accurate and reliable and was widely used.

The hearing examiner, Seymour Wenner, ruled that individual testimony based on the survey was admissible, but he did not foreclose an attack on the survey itself.

Another question raised by distributor representatives during cross-examination was this: if higher prices are needed as an incentive to find new gas, should this higher price apply to old gas?

And they questioned the generally accepted producer yardstick of a reserves-production ratio of 20 to 1 as necessary to assure continuing adequate supplies. Why wouldn't a ratio of 10 to 1 or the crude oil ratio of 12 to 1 be adequate, a distributor attorney asked.

However, it appeared that the showdown issue will be on the matter of whether individual cost figures must be made available to intervenors and placed in the record.

At the pace the hearing was making last week, the answer will not be forthcoming soon.

Humble makes deal for Olin pipelines

Stock swap would give Humble all assets of New Orleans-based firm which has 1,284-mile gas-transmission system in Louisiana and Mississippi.

HUMBLE Oil & Refining Co. is preparing to take over a 1,284-mile gas-pipeline system in Louisiana and Mississippi by acquiring the stock of Olin Oil & Gas Corp., New Orleans.

The $68-million deal emphasizes Humble's new interest in the natural gas and pipeline business. The company did not, however, disclose how the Olin system—which spreads out mainly from Baton Rouge—will be integrated into the Humble operation.

Humble and Olin said last week that their respective boards had agreed tentatively to a tax-free stock exchange plan under which Humble will acquire all of Olin's assets, and Olin stockholders will receive common stock in Standard Oil Co. (N. J.), parent of Humble. In the exchange, Olin's 2,830,000 shares would be worth about $24 each, or a total of $67,920,000. Olin shareholders must approve the deal.

What Olin has. Olin's assets are tied up mainly in its wholly owned subsidiary, Olin Gas Transmission Corp., which has executive headquarters in New Orleans and operating headquarters in Monroe. The parent company also has about 3,300 bbl. net daily of oil production.

The gas-pipeline system has a daily capacity of 550 million cubic feet and consists of 1,284 miles of 2-to-24-in. lines, mostly in Louisiana. The Fowler-Baton Rouge system ties the Monroe field of Northeast Louisiana with Baton Rouge and passes through the southwest corner of Mississippi.

The Baton Rouge - West system connects with southwestern Louisiana fields. The Baton Rouge-South system connects with South Central and coastal Louisiana fields.

Most of the gas is sold to industrial consumers in Baton Rouge, Plaquemines, and Natchez, Miss., areas. The system is interstate at the point where it crosses the Mississippi River at Natchez and then reenters Louisiana further south.

The current deal is not the first which Olin has had with Jersey Standard.

In 1953 Interstate Natural Gas Co., which owned the present Olin pipeline system, was controlled by Jersey (about 53%), and by Olin Industries, forerunner of Olin Oil & Gas, owned a small interest. Olin Industries then formed Olin Interstate Corp. to acquire all the assets of Interstate Natural Gas.

Before Olin Industries merged with Mathieson Chemical Corp. to form Olin Mathieson, it spun off its pipeline properties under a new company, Olin Oil & Gas, which then formed the pipeline subsidiary, naming it Olin Gas Transmission.

Net assets of Olin Oil & Gas in 1960 totaled $49 million. Its net income last year was $3.48 million compared with $3.6 million the previous year.

Announcement of the plan for Humble to acquire Olin was made after a New York meeting of the company boards. Chairmen Morgan J. Davis of Humble and John W. Hanes of Olin said the plan is subject to Olin stockholder approval, clearance by governmental authorities, and settlement of corporate problems. The transaction should be completed early in 1962.

Deep production record set

Gulf test in western Oklahoma taps deepest Pennsylvanian production. Only Louisiana has a deeper producer.

SEVERAL drilling records fell by the wayside in Oklahoma last week.

A Gulf Oil Corp. wildcat in far western Roger Mills County found the deepest Pennsylvanian production anywhere, tapped the deepest production outside Louisiana, and became the first well out of 25 attempts to find production in Roger Mills.

Gulf 1 Hartley, an old well drilled deeper in NE NE NW 34-14n-26w, flowed 2,250 M.c.f.d. from openings in the Morrow-Springer Pennsylvanian at 17,127-17,435 ft.

Flow was on ½-in. choke, and tubing pressure was 350 psi. The well flowed 80 bbl. of mud and water with test, and the operator was cleaning out at 15,191 ft.

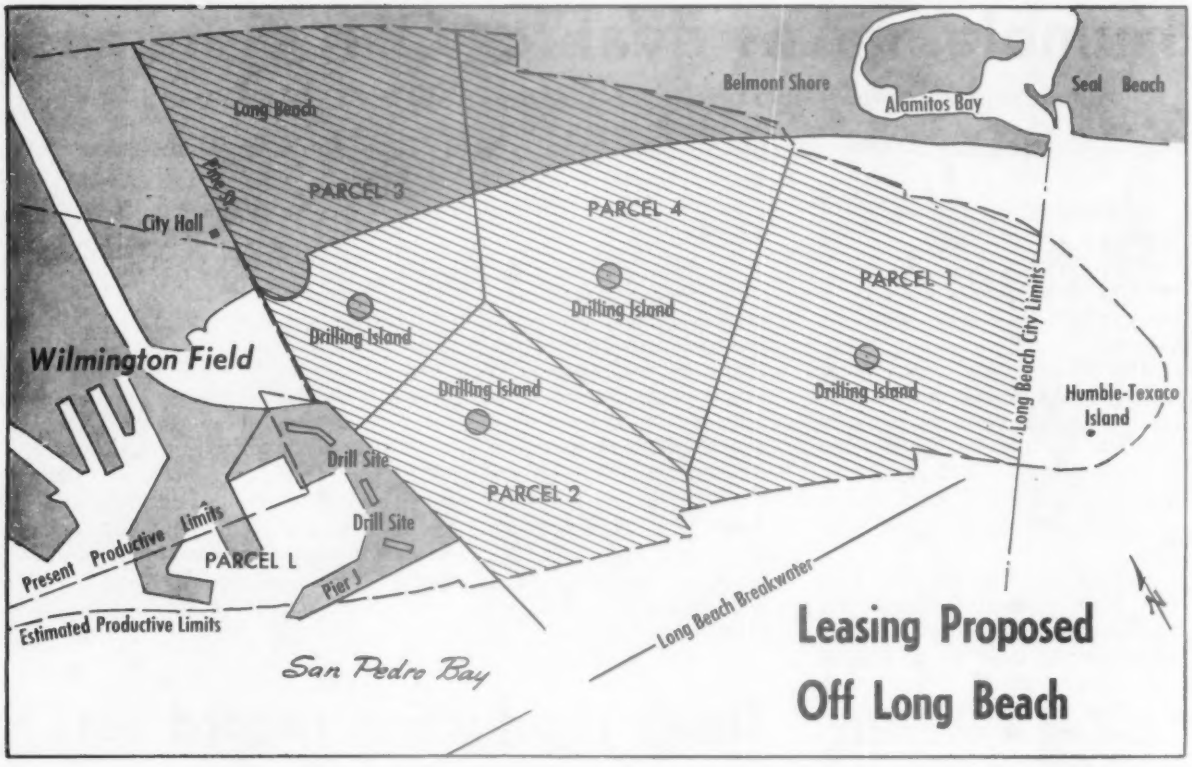
Old total depth of the former Humble wildcat was 12,384 ft. New total depth is 17,558 ft.

Nearest production to the Gulf wildcat is at 10,271 ft. in Hoxbar Pennsylvanian in Beckham County (see map).

If Gulf completes the well as a commercial producer, it will bring success to the last of the counties in the vast Anadarko basin of Oklahoma, Texas Panhandle, southwestern Kansas.

Earlier this year, Gulf 1 Wood in Grady County, Oklahoma found gas condensate at 16,376 ft. in the Pennsylvanian. Up to now it was the deepest producer in rocks of that age (OGJ, Mar. 20, p. 74).

Deepest production anywhere remains in Plaquemines Parish, Louisiana, at 21,443 ft. (Richardson and Bass et al. 1-L Humble LI&E).



Long Beach may lease offshore plum

City council's studying proposal to lease tidelands portion of Wilmington field, may put issue on February ballot. Area is considered California's top unleased area with reserves estimated at 797 million barrels.

OIL operators may soon get a chance to drill in the tidelands area of Long Beach's lucrative Wilmington field.

The Long Beach city council is considering a development program which would open the 6,500 acres of semiproved oil territory to leasing. There is a chance a special election will be held February 27 to amend the drilling ban which prohibits drilling in the tidelands.

The drilling plan proposed by the Long Beach Harbor Department sets the primary and secondary reserves in this undeveloped portion of the field at 797 million barrels. This includes 260 million barrels of oil which would be recovered as the result of a pressure-maintenance program which would go hand-in-hand with drilling up the field. The injection program is a safeguard against subsidence.

If the area is opened to leasing, California companies are expected to clamor for a chance to drill in the offshore area of the state's biggest oil field. Wilmington produces 76,000 bbl. daily and cumulative production is 900 million barrels.

There is little doubt a large oil reserve lies off Long Beach. Only the subsidence in the main portion of Wilmington has prevented previous leasing.

In addition to the Wilmington production, Belmont offshore field is producing about 4,000 bbl. daily at the east end of the seismic structure. The area which would be leased lies between the two fields.

Texaco Inc. and Humble Oil & Refining Co. are developing Belmont from a drilling island on a state lease off Seal Beach. The lease is just outside Long Beach's city limits.

M. D. Hughes, director of subsidence and petroleum for Long Beach, claims "several million dollars" worth of oil has been drained from Wilmington from the Seal Beach island.

What is proposed. The drilling plan splits the 6,500 acres into four parcels.

A portion of the downtown Long Beach area is included in one parcel and another takes in part of Long Beach's resort area.

Drilling is planned from four 10-acre islands and three drill sites on the proposed Pier J, which would be built at the western limits of the area. Exact location of the drilling islands would be determined by a series of at least eight core holes. The islands would handle both offshore wells and some holes which would be slant drilled into the townlot and downtown areas.

The proposal recommends that the easternmost lease be developed

first in order to avert further drainage from Belmont offshore field.

The harbor department estimates at least six of the eight productive zones in the developed portion of Wilmington are productive in the extended area. And gas recovery is estimated at 163 billion cubic feet.

At least 628 producing wells and 262 water-injection wells would be needed to develop the 6,500 acres, according to the harbor department report. Development would be on approximately 20-acre spacing. The injection program would be on a five-spot pattern for the Ranger zone and as peripheral floods in the other five zones.

Next step. If the voters agree to lift the drilling ban, the city is expected to move quickly to get the land up for leasing.

The leasing probably will be on a royalty basis—and the royalties are expected to run high. Some present Wilmington leases carry a 70% royalty. Even higher rates may be offered for the new acreage due to the state's poor wildcat success ratio and declining crude production.

Cities Service buying big interest in Texas' Fairway field area

CITIES Service will make a major addition to its interest in Fairway field, Texas, with the acquisition of all stock of Fairway Oil & Gas Co.

Under the agreement, Cities Service will acquire properties involving an estimated 30% interest in leases covering about 7,000 acres in or near Fairway field in Anderson and Henderson counties.

Completion of the transaction is contingent upon title searches and other studies now under way. Purchase price was not disclosed.

In addition, Cities Service is acquiring other interests in some of the neighboring leases.

Cities Service now will be operator on approximately 40% of the field as presently known. Limits of the producing area have not been fully defined.

Fairway field was brought in last year (OGJ, Sept. 11, p. 75).

Blaze at storage well "turned off"

FIRE at an underground-storage well of Natural Gas Storage Co. of Illinois was extinguished last week by four men who braved 100-ft. flames in asbestos suits.

Immediately after the fire started at noon, November 14, asbestos suits were flown by helicopter to the Herscher, Ill., underground-storage field 60 miles southwest of Chicago. The field is owned by an affiliate of Natural Gas Pipeline Co.

At 4 p.m. four asbestos-suited employes, under a covering spray of water, penetrated to the center of the flames and turned a valve at the well. This put out the fire.

The flames had flashed up when gas leaking from piping failure at the well head was unaccountably ignited. There were no injuries and property loss was only $5,000.

Domestic manufacture urged

Canada wants local oil goods

THE Canadian Government is getting behind a drive to have local manufacturers produce the kind of drilling equipment now supplied almost entirely from the United States.

Trade Minister George Hees has released a governmental survey showing that the market for drilling equipment in Canada exceeds $50 million. And most of it is imported.

"We have facilities in Canada to produce much more of this equipment than at present, and that we must do," the Trade Minister told the Southern Alberta Industrial Development Conference.

As more Canadian firms enter the field—and a survey of 1,500 companies indicates several are interested—their participation is expected to be through licensing arrangements. The local manufacturer could benefit from marketing an established brand, plus the development work which is generally beyond his means.

In a related move, the Canadian Manufacturers Association is proposing a 10% tariff on any such equipment which can be made in Canada. Most oil equipment enters Canada duty free.

Cost of Canada's drilling-equipment imports

	1957	1958	1959	1960
Drilling machinery, parts	$51,646,521	$37,425,855	$38,304,015	$35,833,542
Oil-country goods	.....	4,126,667	8,465,810	8,066,661
Drilling mud	.....	.....	.....	493,105
Total	$51,646,521	$41,552,522	$46,769,825	$44,393,308

Breakdown of drilling-machinery costs for 1960

Geophysical prospecting equipment	$ 372,000
Drilling units	821,400
Drilling equipment	18,351,847
Auxiliary drillers' equipment	1,514,500
Blowout preventers, parts	125,000
Down hole-pressure control and measuring devices	291,000
Cementing equipment	726,000
Perforating equipment	221,000
Well-logging equipment	464,600
Wellhead completion equipment	1,562,600
Fittings	254,000
Valves, parts	1,255,700
Production pumps, parts	2,404,800
Power pumps	963,900
Well-servicing, treating equipment	26,900
Gas-and-oil treatment equipment	420,000
Storage tanks, parts	518,000
Electrical, electronic equipment	55,700
Instruments, gages, indicators, regulators, equipment for analysis	174,000
Rigs	847,000

Jobbers will seek probe of price-war

THE National Oil Jobbers Council favors a national investigation to determine whether the depletion allowance is being used by integrated oil companies to finance gasoline price wars.

After sharp debate, council members last week approved a report directing NOJC officers to seek an investigation by a congressional committee or any other governmental agency able to gather the information.

The action underscored the concern of jobbers throughout their 4-day gathering at the Morrison Hotel in Chicago that current pricing battles basically stem from overproduction. Most jobber officials feel the main chance for correcting present ills will be in legislation.

In other action the council:

Continued a policy of opposing fair-trade bills. However, if such bills appear likely to pass, the council recommended they contain a provision prohibiting the giving of trading stamps.

Reaffirmed opposition to withdrawing price protection for jobbers by supplying companies.

Denied jobbers are taking advantage of margins and price protection to promote or prolong price wars.

Criticized the "unstatesmanlike" attitude of some integrated companies in directly soliciting consumer-transport, governmental, and contractor business.

Asked that petroleum marketing cooperatives be taxed the same as other marketers.

Assailed the practice by some integrated companies of channeling their branded products through unusual or abnormal outlets. The council specifically named discount houses and wholesale grocers which get products at prices ruinous to the franchised jobbers.

Tough times. NOJC officials frankly told council members that their gasoline-pricing troubles are far from over.

They warned that unless more cooperation is shown quickly by various segments of the industry, national legislation may be the way out. They expressed a natural fear, however, that this route would open the way to governmental control.

NOJC President E. K. Bennett declared the pricing chaos originates when the crude oil is produced or imported, and he indicated action at that level is needed to correct the situation.

Bennett explained that in present conditions the company or operator is under pressure to produce all the crude he possibly can in order to take advantage of percentage depletion. The refiner, in turn, is under pressure to refine and market it in order to free his money tied up in crude. This pressurized overproduction results in depressed markets for the products.

Bennett observed that this naturally gives rise to the question of whether percentage depletion is the root of present troubles. Bennett cited this troublesome role of percentage depletion as a warning to producers that they should help try to correct the pricing problem.

Bennett also called on refiners to gear their runs to contract-sales requirements. This means that all their gasoline would be sold through contract distributors, and there would be no excess. Without excess gasoline, no one in the business would be in a position to start a price war, he said.

Fight of brands. Otis H. Ellis, general counsel for NOJC, took a slightly different tack. He saw the marketing woes as stemming from scraps of majors against independents and majors against majors.

"The answer gets down to this," he said. "Some majors in the industry apparently have made up

Competition to grow tougher,

COMPETITIVE pressures will continue to increase in all levels of the oil industry through this decade, Dr. Charles M. Hewitt, a business professor at University of Indiana, told the National Oil Jobbers Council at its annual meeting in Chicago.

Hewitt, also research director of the Indiana Oil Marketers Association, said marketers will continue to bear the brunt of the battle.

"Although most of the integrated companies probably would like to reduce the competitive pressures on marketing, I do not think they will be able to do so," he said.

"Acting as individual firms, their incentives are to maintain maximum crude throughput even when this may mean negligible marketing profits.

"The antitrust agencies also will deter any joint attempts made to stabilize marketing prices. The antitrust laws and the incentives to continue the exploration for crude virtually guarantee a continuation of the oversupply into the foreseeable future."

Hewitt said oil's policies still are producer oriented. The depletion allowance, intangible drilling allowances, and state conservation laws, he said, are aimed at encouraging production and discovery of more and more reserves. As long as these policies exist, crude overproduction will persist, he said.

Trends. Controlled distribution through vertical integration will become stronger, Hewitt said, meaning that all jobbers will be more like consignees in the future.

A chaotic competitive situation is forcing both majors and independent refiners to seek control of marketing outlets. The same conditions are forcing more nonintegrated refiners and marketers to sell out or to make price-protection arrangements with integrated supplying companies.

Jobbers, as a result, will have no choice but to trade part of their freedom as independent businessmen for a measure of security.

Hewitt declared this trend eventually should stabilize marketing prices if it were not for these factors:

1. **Crude production** will be difficult to curtail because of political and antitrust considerations.

2. **Government policies** will make it difficult for majors to exercise control over crude supply which

financing

their minds they won't let private branders enjoy more growth. Private branders, then, have become the whipping boy for market conditions."

Ellis pointed out that the fighting doesn't stop here but finds majors engaged in new pricing policies and brand promotions that compound the competition and price wars.

Ellis added: "One thing bothers me about the depletion allowance. How can some majors participate in price wars and still show a profit?

"That's the question the producing segment had better get ready to answer to Congress. There's going to be an accounting. The private brander has a place in the market. There are some in the ranks that would pull the house down on us all. The fault really lies in all segments."

educator says

is handled through their pipelines.

3. Pressure to import more foreign oil because of international political considerations will increase.

Hewitt also warned there may even be a political explosion affecting the industry before the long-term trends toward price stabilization have a chance to work out.

The outlook for jobbers, Hewitt said, is for fewer companies with bigger operations. Automation and mass selling call for big volume, standardization, technical personnel, and heavy financing. This means many jobbers will be unable to finance the needed growth and innovations.

Hewitt suggested that NOJC should inaugurate a massive research program to determine exactly what is happening to jobbers. The data could be compared against census figures and the trends plotted.

A similar research program by state jobber groups should be undertaken to chart the inroads made into markets by natural gas and electricity and to keep track of the frequency and duration of price wars. Answers to many jobber problems might be furnished by the information turned up.

WATCHING WASHINGTON

with Clyde La Motte

Who is President Kennedy's guide in oil matters?

IT IS becoming increasingly evident that no individual has yet emerged as the administration's key signal-caller on oil issues at cabinet level.

When President Eisenhower was in office there was a general awareness that he relied heavily on Treasury Secretary Robert B. Anderson for guidance on oil. Thomas C. Mann, Assistant Secretary of State at the time, and Arthur V. Fleming, who held several key posts during those years, were also influential.

But thus far their Democratic counterparts have not appeared on the scene.

When President Kennedy took office it seemed that he intended to handle all key issues, including oil, personally. But there are many indications now that he is coming to realize he cannot play all the positions of the infield at the same time and must turn more and more to a team approach.

Interior Secretary Stewart L. Udall, who plunged into oil problems at the outset, has been drawing away from them in recent months. No other cabinet member has shown much interest in oil.

It may well be, in view of this setting, that John M. Kelly, assistant secretary for minerals at Interior, may wind up as the No. 1 man on oil.

Observers watching the progress of plans for revisions of the oil-import-control program noted that Kelly was the central figure. And, they reasoned, if he succeeded in "selling" his program to skeptics in the other departments, or if he convinced President Kennedy despite their opposition, it would undoubtedly increase his stature greatly.

A new flurry of oil-related activity in Washington

OIL representatives are being kept hopping in Washington. Last week there were FPC hearings on Permian basin area-pricing controls.

This week a House subcommittee headed by Rep. Tom Steed (D.-Okla.) is beginning a lengthy series of hearings on oil-import controls and related issues. As soon as the subcommittee hears governmental spokesmen, it will turn to oil-association and individual-company representatives. API President Frank Porter is one of those scheduled to appear.

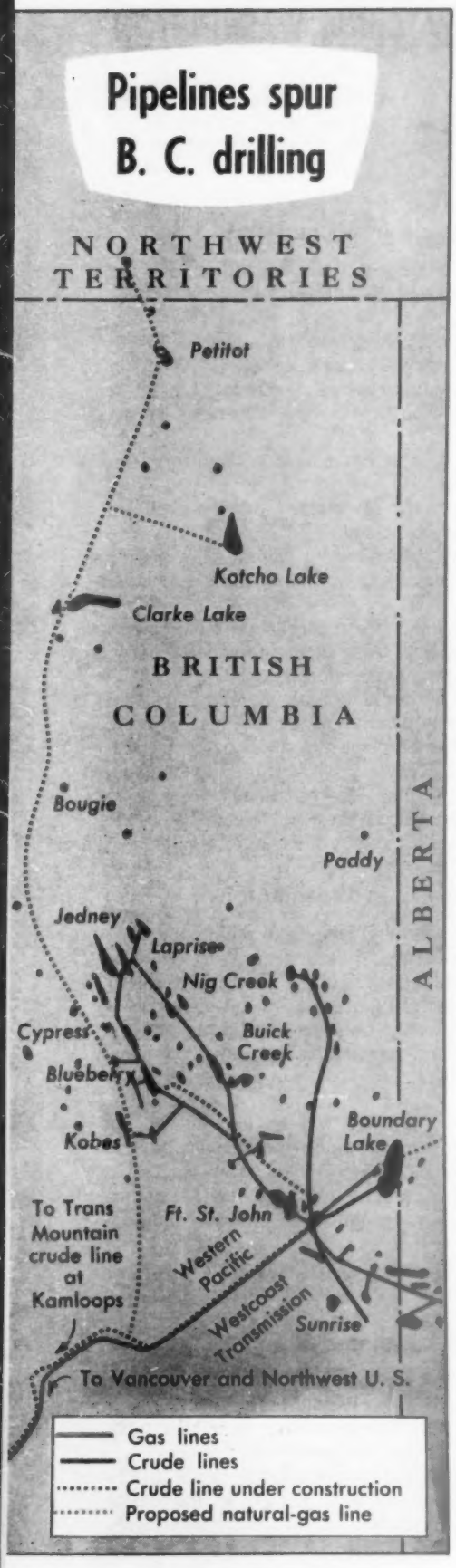
Next week another House subcommittee will be looking for the impact, if any, of oil-import controls on oil-industry employment. Several oil associations and companies have been invited to appear.

Aside from the public hearings, several other oil-related studies of one sort or another are under way. In almost all of these, industry views are being solicited.

Furthermore, the National Petroleum Council will meet this week and may draw another assignment or two from Interior.

Office of Oil and Gas steps up readiness planning

HERE AND THERE in Washington: Department of Commerce has submitted a report on transportation to the White House, but it is still under wraps . . . Public hearings on service-station ownership have been delayed; the committee staff is too busy with other studies . . . Office of Oil and Gas has already staffed five of eight regional offices as a part of its move to have an oil-executive reserve in immediate readiness, equipped with detailed information on oil-facility availability down to precinct level.



Winter-drilling record on way in northeastern B. C.

EVERYTHING points to record drilling pace this winter in northeastern British Columbia.

One big reason: new pipeline outlets to the south. Other factors: operators have a lot of drilling to catch up on because of last year's short freeze-up; obligations from farm-out agreements; and drilling required under terms of lease sales.

Last year a heavy snow fell just before the freeze-up, insulating the muskeg against frost penetration. This delayed the winter drilling upsurge for 3 weeks. And on top of that the spring break-up came early.

Although oil companies have spent millions building roads in western Canada, there are still vast areas where drilling is confined to deep winter when the muskeg is frozen solid. These include parts of Alberta's Peace River block, most of northeastern B. C., and the Northwest Territories.

Industry sources predict 225 rigs will be active at the peak of this season's program in western Canada. This is the same as last winter's peak. But a good cold season would allow time for rigs to make more hole.

These sources forecast that well over 150 development wells and 60 wildcats will be drilled in northeastern B. C. during the cold season. This compares with a combined total of 143 last year.

Pipeline outlets. A new pipeline has paved the way for the first substantial movement of B. C. oil to market.

Western Pacific Products & Crude Oil Pipelines, Ltd., will finish its 505-mile 12-in. line from Taylor before the end of this year. It connects at Kamloops with Trans Mountain Oil Pipe Line Co.'s system to Vancouver.

Imperial Oil, Ltd., is getting ready to buy 7,000 bbl. daily of B. C. crude for its Ioco refinery near Vancouver (OGJ, Nov. 13, p. 121). Imperial and its partners are drilling 40 development wells in the Boundary Lake field, and will step up activities considerably.

British Columbia Oil Transmission Co., Ltd., next month will finish its crude line from Blueberry field to Taylor, where it connects with Western Pacific's line.

Biggest incentive for far north drilling is Westcoast Transmission Co.'s plan to expand its 30-in. system north through the Fort Nelson region into the Northwest Territories. Construction may start next summer.

Active areas. The Fort Nelson region, boasting such Slave Point (Middle Devonian) reef notables as Clarke Lake, Kotcho Lake, and Petitot, has been red hot every winter since Western Natural Gas Co.'s prolific discoveries in 1958. The area covers nearly 6,400 acres.

It's likely that 20 rigs will operate this winter around Fort Nelson and Celibeta Lake.

Imperial will be drilling in the Netla region north of Home Oil Co., Ltd.'s Celibeta operations.

Pure Oil Co. has a location 50 miles southwest of Clarke Lake field on a farmout from Pacific Petroleums. Western Natural plans three wildcats and two development wells—the latter in Clarke Lake and Kotcho fields. Pan American Petroleum Corp. is expected to drill three tests in the general Northeast B. C. region.

Hudson's Bay Oil & Gas Co., Ltd., has made a significant discovery on its Sikanni Chief acreage in northeastern B. C. The discovery, Hudson's Bay b-27-F-94-B-15 Cypress, recorded natural-gas flows up to 11.6 million cubic feet daily during drill-stem tests.

Westcoast Transmission says about 200 development wells may be drilled during the next 12 months in major fields in the Peace River area. These include Boundary Lake, Milligan Creek, Woodrush, Beatton River, Wildmint, Peejay, and Blueberry fields.

Only one operator of the large number contacted in the pre-season survey says he has no plans for drilling this winter in northeastern B. C.

Project built without guarantees

New England jet-fuel line in operation

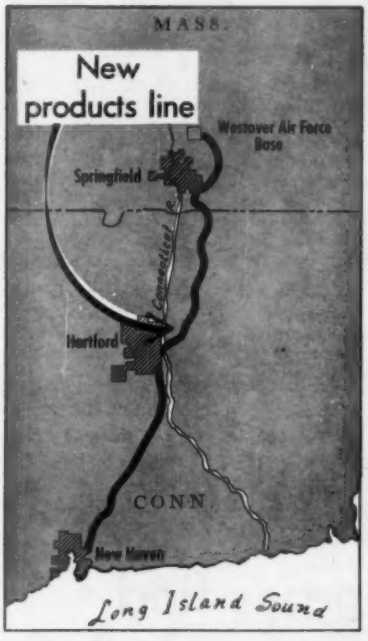
AN UNHERALDED pipeline was revealed last week to be pumping jet fuel from New Haven, Conn., to Westover Air Force Base near Springfield, Mass.

The project, built by Jet Lines, Inc., an "outsider" unrelated to any oil company, is among several efforts to gain the economic advantages of products pipelines in New England.

Jet Lines has for several days been pumping jet fuel through its 80-mile 12-in. line to Westover Base, at Chicopee, Mass.

Only a few pipeliners realized that the line had been under construction because it is owned outside the industry by Savin Brothers, Inc., Bloomfield, Conn., highway, dam, and marine construction contractor. The same firm designed and built the line, costing about $6 million.

President of Jet Lines is M. S. (Pete) Savin. Stanley C. Weber is system superintendent. The project was promoted by Charles Neal, New York City, who has been identified with attempts to promote eastern pipelines known as Plymouth, Mayflower, and Conn-Mass.



At present the Air Force, Jet Line's only shipper, has contracted throughput between 2,000,000 and 3,000,000 bbl. for 1 year. Tariff rates are said to be 35% of truck rates to the northern part of the line.

Jet Lines is soliciting business from commercial shippers. The line has separate Air Force and commercial tariff rates.

The owner went into business without any throughput guarantees or letters of intent. In this respect it is notable in pipeline history, for it appears to have no sponsors who can commit product to the line.

In its 300,000-bbl. leased storage at New Haven, the Air Force receives fuel which is pumped through the line by two electric centrifugal pump stations. One is at New Haven, with two 700-hp. units, and the other is at East Hartford, with one 700-hp. unit. Fuel is received in the pipeline's floating roof storage at Ludlow. From there it is pumped by two 200-hp. pumps to storage at Westover.

Products lines to New England being studied

Use of railroads' right-of-way included in proposals. Lines would start in New Jersey and would cross Hudson River Valley, Long Island area.

SEVERAL products pipelines are being considered for construction from the Linden, N. J., refining area into New England.

They would follow either of two previously discarded routes — one approaching from the Hudson River Valley and the other via Long Island and Connecticut (OGJ, Nov. 13, p. 129).

Ford, Bacon & Davis, Inc., is undertaking to bracket the interest of major companies in one project. It would use the New York Central Railroad right-of-way from Linden going north on the west bank of the Hudson to the Peekskill, N. Y., area.

There it would cross the river and extend upriver to Poughkeepsie, N. Y., branching there to Albany and Springfield, Mass. There are other proposals to extend the line to Boston, with potential shippers differing as to the destination.

Interest in the line is stimulated by rising tanker rates to the Albany area and inland truck rates.

Ford, Bacon & Davis is encouraging the formation of a firm to be owned and managed by major companies who would build the line. The New York Central would be compensated for the use of its right-of-way by a commensurate equity.

Ford, Bacon & Davis would like to get the contract for engineering and management of construction.

During recent weeks Sun Pipe Line Co. has been looking at a similar project to New England which would make use of railroad right-of-way. At least six major companies would need to join in order to get the advantages of large throughput.

The project is conceived as an undertaking of major companies. They would work together for the financing, engineering, construction, and management of the line in the customary manner of pipeline companies.

The Long Island pipeline from Linden via Staten Island and the Narrows Harbor crossing is being considered by another group of major companies. An announcement may be made in a few weeks. Such a line has been weighed previously and dropped.

Texas finally nudges allowables above 8 days

TEXAS crude producers in December will get their first big boost in allowables in over 8 months.

The Texas Railroad Commission last week set next month's allowable at 9 days, breaking a string of seven consecutive record-low 8-day patterns.

Next month's allowable was set at 2,872,535 bbl. daily, an increase of 166,440 bbl. daily over the initial allowable for November and a boost of 140,379 bbl. daily over that in effect November 4.

Most major companies and independent operators favored 8 days. But the commission apparently was influenced by the fact that most of the biggest crude buyers were in the 9-day group. These companies indicated they would be buying large quantities on the spot market even on 9 days for December.

Refinery crude runs

Company—	Avg. in bbl. daily*	% of Capacity
Petrofina	26,157	87.2
Atlantic Ref.	210,994	100.5
Bell†	5,919	74.0
Bryson Pipe Line	485	44.0
Cities Service	264,490	90.3
Continental	173,565	89.8
Cosden	33,680	78.3
Crown Central	34,624	86.6
Danaho Refining	3,941	32.8
El Paso Natural	22,874	93.4
Gulf	433,807	77.0
Humble	796,000	82.7
Indiana Oil	630,900	87.1
LaGloria	17,064	71.1
Monarch	2,138	53.4
Ohio	99,053	85.6
Permian	2,074	51.9
Phillips	217,400	79.3
Plymouth	32,881	73.0
Premier	12,530	56.0
Pure	167,902	89.8
Rado Refining	613	40.9
Shamrock	25,028	92.7
Shell	585,291	98.5
Signal	61,860	103.1
Sinclair	437,382	89.4
Skelly	32,450	60.0
Socony Mobil	614,000	85.6
Sohio	151,100	88.6
Standard (Tex.)	48,266	64.4
Sun	172,447	67.6
Suntide	43,187	66.4
Texaco	632,707	85.6
Tidewater	220,161	80.1
Others	2,506	66.3
October total	6,215,476	
September total	6,070,250	

*As reported to Texas Railroad Commission. †Ceased refining operations as of Oct. 31, 1961.

California has big gas find

Mud logs show Occidental well in San Joaquin County has 676 ft. of net pay. Flow hits 22 million feet daily.

A MAJOR gas discovery is shaping up in the northern tip of the San Joaquin Valley in Central California.

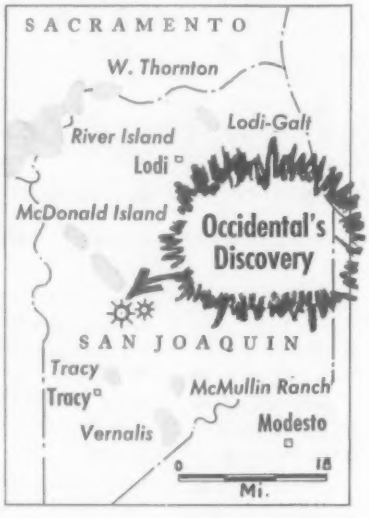
Occidental Petroleum Corp.'s 1 Lathrop unit B in Sec. 5-1s-6e in San Joaquin County flowed at the rate of 22,653 M.c.f. daily during drill-stem tests of four zones from a gas column about 2,000 ft. thick.

The best flow was from a 32-ft. section at 8,353-85 ft., deepest of the four zones. This section produced at the rate of 8,525 M.c.f. daily through a ¼-in. bottom-hole choke.

The company reports the pressure drawdown was only 200 psi. during the tests. No official bottom-hole pressure figure was revealed, but it was reported "in excess of 4,000 psi."

The sand count on the mud log showed 676 ft. of net gas sand in the well, but additional testing indictates net gas sand may hit 750 ft.

Occidental, one of the leading gas explorers in California, estimates the Lathrop B-1 proves up reserves estimated at 140 billion cubic feet. The B.t.u. content of the gas is



something just under 1,000, but a complete analysis has not been made.

The Lathrop B-1 is 4,000 ft. west of the Lathrop unit A-1, which was completed as the discovery well in Lathrop field in early October (OGJ, Oct. 9, p. 153).

Deeper pay? Production in the Lathrop wells is from the Upper Cretaceous E zone. The zone is believed to correlate to the Winters sand in West Thornton field about 30 miles to the north. Most production in this area is from the F zone of the Upper Cretaceous.

Lost circulation forced the operator to bottom the Lathrop B-1 at 8,935 ft. while the well was still in the gas-sand series. Wet stringers separate the pay zones, but additional pay might have been found below total depth.

Occidental probably will program a deep test to around 15,000 ft. in an effort to cut through the E zone and into the F zone.

The first well indicated the pay was from a combination structural-stratigraphic trap, but the second well looks more like pure structure.

The northern and western limits of the field may be determined by a major fault which is known to exist in this area.

The other three zones tested in the Lathrop B-1 were 6,919-57 ft. with a flow of 5,015 M.c.f. daily; 7,607-34 ft. with a 3,780 M.c.f. daily flow; and 7,753-93 ft. with a flow of 5,333 M.c.f. daily in the discovery well, the flow was from three zones between 4,059-7,519 ft.

The next well in the area will be about one-half mile east of the discovery on a 642-acre unit formed with Universal Consolidated Oil Co.

EXPRESS-LANE design used in this Tulsa station will be one of basic features of DX outlets in the future.

New DX station concept stresses efficiency

TODAY'S motorist is more interested in efficiency than price and is more concerned with convenience than quality.

That's the philosophy behind a new concept in service-station design unveiled last week by DX Sunray Oil Co.

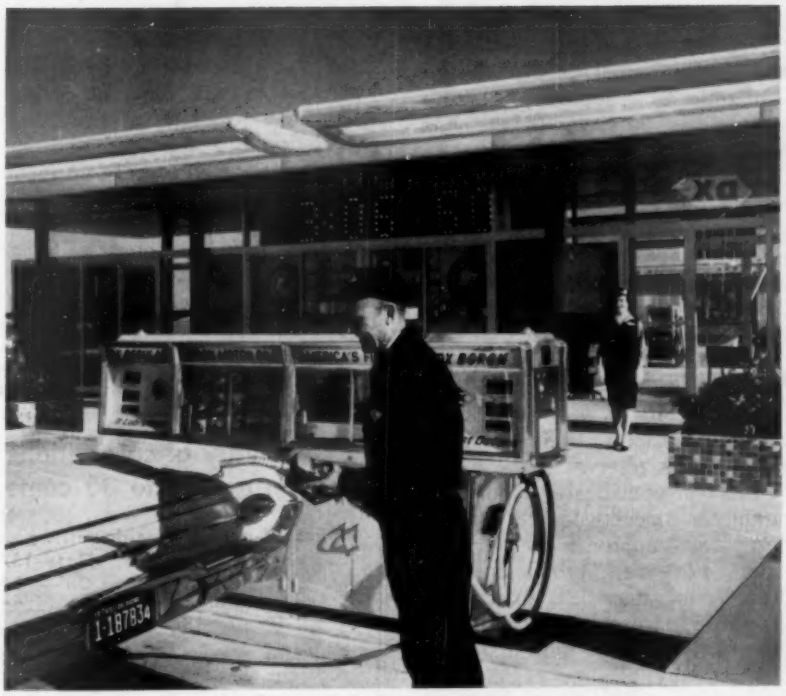
DX has moved the wash and lube bays and the manager's office to a separate building away from its gasoline-sales area. Out in front in the new "express-lane" design is a service island with pumps and driveways front and back. Its object: Speed servicing for a busy motorist.

S. D. Breitweiser, DX president, said the "express lane" will become the second basic design for future DX Sunray stations. The first new approach, the DX Circle, was introduced less than a year ago (OGJ, Sept. 11, p. 82).

The first express-lane station was opened last week in Tulsa, on the approach to the city's new airport terminal. Others are nearing completion at Waterloo, Iowa, and Cape Girardeau, Mo.

The central island contains a 9 by 18-ft. snack-bar, vending-machine room (at left in top photograph) and a customer lounge at the opposite end. In the center, opening to the rear, are the rest rooms. To the front, this center area is used as a large TBA display case. This first station of its design will operate with an average of 10 attendants and a hostess, Breitweiser said.

A principal feature of the new design is its flexibility. DX figures it can eliminate the service bays on those sites where public demand is for gasoline only. This would leave it with four service lanes and eight pumps and a setup geared for speeding the motorist on his way.



STATION hostess watches as attendant fills tank from one of the pumps at streamlined service island in DX's newest outlet.

The new design also complements the circle design. The circle, DX figures, is ideal for intersections where cars approach from more than one direction. The express lane fills the bill for straightaway traffic.

Breitweiser said the new station was designed after a 2-year market-research and design study made by Lippincott & Margulies, Inc., New York.

The study showed, he said, that today's customer is not as price or quality conscious as most companies would like to believe, and that convenience, efficiency, attractiveness, and friendliness are what customers really want.

Incentive gas pricing—3

Adequate gas supply hinges on price

Henry Ralph
Chief Editorial Writer

THE wellhead price of natural gas will have to rise to somewhere between 20 and 33 cents per thousand cubic feet during the present decade if enough new supply is to be developed to meet anticipated demand.

This conclusion was presented to the Federal Power Commission in the Permian basin area-pricing hearing by Ira H. Cram, vice president of Continental Oil Co., as one of the dozen witnesses for some 60 producers in that proceeding.

The conclusion was not pulled out of the air. It was reached through a painstaking analysis of industry-wide statistics. A summary of Cram's calculations is given in the box below.

Reverting to his personal judgment, Cram testified that a realistic goal would be an average wellhead price of about 20 cents per thousand cubic feet in 1961-1965, and about 25 cents during 1965-1970. He said it is reasonable to expect that cost per B.t.u. of reserves added will increase about 7% per 5 years, and that about 54% of wellhead revenue will be allocated to finding and developing new reserves.

This type of evidence supports the producers' "incentive-price" or "industry-cost" approach to gas regulation. For years producers have been saying that field prices will have to rise to support exploration, but this is the first time that FPC has had any tangible evidence of why and how much they must rise.

1. Key to gas hunting

As a geologist, Cram avoided speculating as to how much is hidden in the earth and may ultimately be found.

"However," he said, "the resources to date have always responded to a sustained drilling program based upon the best exploratory information available at the time. Not until the resources fail to respond to such a sustained drilling program over a period of years (say 5 years) will there be grounds for concern over the magnitude of our remaining resources."

THIS is the third in a series of articles presenting the producers' case for incentive gas pricing. The series is based on testimony at an FPC area-price hearing. Earlier articles appeared in the October 30 and November 6 issues of the Journal.

But as a corporation executive, Cram said there will not be an extensive exploration program for gas unless operators have a reasonable expectation that the revenue from gas sales will yield a profit on their investment in drilling.

What's been happening. He then analyzed the industry's experience during the past 10 years to demonstrate that gas is getting harder to find, that the trend in exploration is downward, that exploration costs are increasing, and that higher wellhead revenue now is necessary to obtain the supplies that will be needed in a few years.

"The decline in drilling activity since 1956 indicates a lack of incentive for a sustained exploration program," he said.

"Expenditures for exploration for natural gas are responsive to the revenue which may be derived from the sale of gas. But there is a time lag of several years between the time leases are taken and sales begin.

"The result of this delay in the receipt of revenue is that operators hold back on new investments when the rate of return is declining until they see reasonable prospects of arresting or reversing the trend.

"The many problems boil down to just one—where is the money going to come from to build a sup-

How Ira Cram figures gas prices

Summary of calculations showing wellhead gas prices must average 20 to 33 cents per M.c.f. during current decade

Estimated demand for domestic production during 1961-1970 decade:
Gas—157.4 trillion cubic feet
Oil — 38.1 billion barrels
Net hydrocarbon production—338,000 trillion B.t.u. (52% gas, 48% oil).

Additions to reserves needed to supply this demand:
Gas (at 20:1 ratio)—270 trillion cubic feet, or 294,000 trillion B.t.u.
Oil (at 12:1 ratio)— 33 billion barrels or 191,000 trillion B.t.u.
Total hydrocarbons, 485,000 trillion B.t.u. (61% gas).

Reserves added by drilling in past decade:
1951-1955—193.0 million B.t.u. per foot and 778.3 billion B.t.u. per well (51% gas)
1956-1960—190.2 million B.t.u. per foot and 781.8 billion B.t.u. per well (59% gas)

Therefore, based on past discovery results, 1961-1970 will require drilling an average of 62,300 wells and 255 million feet per year.

The industry's average cash outlay for finding and developing was:

	Per million B.t.u. of reserves added	Total cash outlay
1951-1955	$0.103	$19.6 billion
1956-1960	$0.117	$23.1 billion

or an increase of 14% in the unit cost.

rise, FPC told

ply of gas that will support the anticipated increase in demand?"

What gas must achieve. The money won't come from crude-oil sales, Cram said, citing industry forecasts that the wellhead crude price probably will not increase in the near future and that domestic producing requirements can be met in the next decade with a drilling program much too small to yield the needed gas reserves as a by-product of oil operations.

"Gas will have to assume a larger role in supplying the wellhead revenue required to step up exploration," he concluded. "Gas will have to stand on its own feet and pay its own way."

2. A look at trends

In showing how industry exploration effort is declining and becoming more expensive, Cram made these analyses of past trends:

Statistics on the proportion of successful wildcats to total wildcats indicate a slightly declining percentage of productive wells since 1954. This suggests that the risk in wildcatting is increasing.

The greater number of wildcat wells per field is due in part to the necessity of expanding exploration into the search for stratigraphic traps. The drill is now being used increasingly to find the trap as well as the contents of it.

The ratio of domestic wildcat wells to total wells drilled (excluding service wells) increased markedly from 1937 to 1952 and has been declining since 1956. This decline in the ratio as well as in the number of wildcat wells indicates the decline in the industry's exploratory efforts.

Also, over a period of years the proportion of gas discoveries has generally increased, particularly in the last 5 years. In these 5 years, 30% of the productive wildcats are listed as productive of gas, whereas in the previous 5 years, 1951-1955, only 23.7% were productive of gas. The incentive furnished by rising gas revenue is in part responsible for this result.

Dry-hole figures. The statistics on dry holes compared with total well completions also show the increasing risk in drilling. For example, in 1937, 20.4% of all wells completed proved to be dry. By 1960 the per cent of dry holes had almost doubled, amounting to 39.9%.

Likewise, the trend of dry footage to total footage has shown a rather constant increase. The number of dry holes drilled is also a measure of the industry's effort to find and develop production. The decline in the number of dry holes drilled during the last 5 years clearly indicates the declining effort being made by the industry.

The number of dry holes drilled annually has increased at a faster rate than has the number of total wells. Or, put another way, an increasing percentage of total wells drilled since 1937 have been dry.

Of particular importance is the relationship between wellhead revenue and drilling activity. From 1934 through 1957 the relatively rapid increase in revenue (prompted, in part, by increased production volumes) had a very stimulative effect on drilling. However, since 1957 the general leveling off of revenue has encouraged a distinct decline in drilling activity.

3. Some other trends

Several other trends are apparent from a study of drilling statistics, Cram said.

First, the average depth of all wells has increased.

Second, total annual additions to reserves (in British thermal units) have not increased as rapidly as either total wells or total footage drilled. This means that over the years the drilling required to block out a given quantity of reserves has been on the increase.

Third, there has been a leveling off in the year-end reserves picture during the past few years which coincides with the decline in drilling. The over-all decline in drilling since the 1956 peak has finally shown up in the poor reserves-added picture reported for 1960.

Ultimately, the ratio of reserves to production suffers unless a sustained drilling program is maintained. Obviously, prudent operators sustain a drilling program only when revenue is sustained or is expected to be sustained.

will have to start upward trend

To achieve needed additions to reserves, industry's finding and developing outlay must be,

	Millions B.t.u. of reserves added	Total cash outlay
Assuming continued 14% rise in costs:		
1961-1965	$0.133	$30.5 billion
1966-1970	$0.152	$38.8 billion
Assuming only 7% rise in costs:		
1961-1965	$0.125	$28.7 billion
1966-1970	$0.134	$34.2 billion

The industry allocated 56% of its wellhead revenue to finding and developing in the 1951-1955 period and 52% during 1956-1960, or 54% of its 1951-1960 wellhead revenue of $79.4 billion.

On this basis, 1961-1970 revenue must range between $112.3 billion and $133.3 billion to let finding and developing outlays equal the indicated need of $62.9 billion to $69.3 billion.

Sources of this wellhead revenue:

Oil —28.1 billion barrels at 1960 price of $2.88—$80.9 billion
Gas—157.4 trillion cubic feet at 20 cents M.c.f.—$31.4 billion

$112.3 billion

Oil —28.1 billion barrels at 1960 price of $2.88—$80.9 billion
Gas—157.4 trillion cubic feet at 33 cents M.c.f.—$52.4 billion

$133.3 billion

Cheaper fuels, lubes needed for 12:1 engines

Researchers know costs of lubricants and fuels for high-compression-ratio engines will have to drop before motorists will accept a switch.

ECONOMICAL fuels and lubricants for high-compression-ratio engines will have to be developed before such engines become popular.

That picture emerges from four papers presented at the recent National Fuels & Lubricants Meeting of the Society of Automotive Engineers in Houston.

Motorists will accept engines with compression ratios of 12:1 and higher only if assured of smoother operation and lower operating costs than present engines can provide.

The attractiveness of high-compression-ratio engines would be canceled out if they required more expensive fuels and lubes.

The papers, authored by researchers at Socony Mobil Oil Co., Sun Oil Co., California Research Corp., and Ethyl Corp., reported on some of the tests made in a hunt for economical lubricants and fuels.

Rumble prevention is a major problem. But problems of hot starting, park throttle knock, spark-plug fouling, and other mechanical factors appear to be minor headaches.

The researchers also say:

Fuels that minimize rumble may contain phosphorous additives, tetramethyl lead, and aromatics or paraffins. Aromatic fuels without phosphorous rumbled, but there was no rumble when phosphorous was added. Paraffinic fuels did not rumble, and they may replace aromatics to keep phosphorous at reasonable levels.

Ashless detergent oils reduce rumble.

Octane requirements for 12:1-compression-ratio engines may be as low as 100.5 RON, or as high as 105.5 RON.

Approaches. The studies took two approaches toward eliminating or minimizing rumble and surface ignition.

The first approach altered fuel composition; the second modified the deposits through additives in the fuel in order to minimize surface-ignition properties.

All rumble ratings in the tests were based on accelerations taken after a light-duty cycle to build up deposits in combustion chambers.

Socony Mobil conducted tests with modified stock-model engines in the laboratory and on the road. Its researchers found that aromatic content was the primary hydrocarbon variable affecting rumble. Paraffin-olefin ratio had a minor effect.

Sun Oil racked up more than 400,000 miles of testing with 17 high-compression-ratio cars over a 4-year period. The company found that 100.5 RON satisfied the average 12:1 ratio car, and concluded that a fuel of 104 to 105 RON should satisfy all 12:1 ratio cars. Sun researchers also found that aromatics promote rumble and phosphorous additives offset rumble from aromatics.

Cal Research conducted tests with eight cars modified for 12:1 compression ratios and drove them more than 300,000 miles. It was found that 105.5 RON fuels would be needed to satisfy 90% of these cars.

Industry briefs

Oil-industry earnings for the first 9 months show a 9% gain over the same period last year, according to a survey by First National City Bank of New York. Machinery was the only industry group with a better percentage increase. But the third quarter was a different story. Oil's 2% decline from the previous year was in contrast to an 8% increase for all industry.

Jade Oil Co., Beverly Hills, has acquired a 15% working interest in oil and gas properties on the Texas Gulf Coast from MPS Production Co., Houston. Jade paid $200,000 and 83,333 shares of common stock for the holdings. The deal involves 10 oil wells, 25 gas wells, and 10,000 proven acres in Matagorda, Madison, Goliad, DeWitt, Lavaca, and Willacy counties.

Sales tax on goods purchased by Texas firms cannot be paid directly to the state, Texas Comptroller Robert S. Calvert has held. Some major Texas industries, including oil firms, had sought permission to pay sales tax directly to the state instead of to their suppliers. Calvert held the law did not authorize such an arrangement.

Purchase of Artnell Co.'s oil and gas properties was announced by Alco Oil & Gas Corp., both of Chicago. Artnell acquired an undisclosed amount of Alco stock in the transaction. Involved are leases on 5,440 gross acres, mostly in Kansas, Oklahoma, and Texas, and 29 producing wells.

Two production acquisitions have been announced by Texas Pacific Coal & Oil Co., Fort Worth. Both transactions involved cash and oil payments. TP acquired the producing properties of Woodson Oil Co., Fort Worth, consisting of 50,000 acres in Colorado, Louisiana, Oklahoma, and Texas, and also obtained 1,068 acres in Hockley County, Texas, from the L. G. Yarborough estate, Clovis, N. M., and W. A. Phillips, Arlington, Tex.

A wild oil well in East Hennessey field, Oklahoma, was brought under control with salt water injections. The well, Big Chief Drilling Co.'s 1 John, blew out during fracture treatment (OGJ, Nov. 13, p. 128).

Proposed sale of Parker Petroleum Co., Ponca City, Okla., to Western Oil Fields, Inc., Denver, has been approved by Federal District Court of Western Oklahoma. Parker has been in reorganization under a court-appointed trustee. Western plans to trade its stock for Parker stock.

Drives start in Texas, Louisiana

Truckers seek higher rig-move rates

OIL-FIELD truckers are broadening their battle for higher rates on rig moves.

The Oil Field Haulers Association has already won the first round in a struggle with drilling contractors and oil-field shippers over higher interstate rates in the Rocky Mountain area.

And the truckers have launched offensives in Texas and Louisiana for sharp hikes in intrastate charges.

Drilling contractors are fighting hard against rate-increase requests. They contend that approval of such petitions by regulatory bodies would be disastrous to their operations.

Here is a blow-by-blow account of the action to date:

In the Rockies, the OFHA has won approval of the Interstate Commerce Commission for a 10-cent-per-mile increase in line-haul rates for oil-field machinery shipments in and between the states of Arizona, Colorado, Idaho, Montana, Nebraska, Nevada, North Dakota, South Dakota, Wyoming, all of New Mexico lying west of U. S. Highway 85, and Canada. Rates also were hiked on pipe shipments exceeding 30,000 lb. in the same area.

The ICC has overruled petitions filed by the American Association of Oilwell Drilling Contractors and the Shippers Oil Field Traffic Association to suspend these increases. But the two groups have asked the ICC's appellate division for reconsideration of the case.

They contend that much of the included area is not in mountain areas, that an excessive portion of the increase falls on short hauls, and that the new scale would discriminate against shipments in these states as compared to shipments originating outside the area.

In Texas, the OFHA was vigorously opposed in a recent hearing on its application for higher intrastate rates before the Texas Railroad Commission. The proposed new Texas rates would include charges for loading and unloading, with a scale similar to that which the ICC rejected on an interstate basis in 1960. Aligned against the Texas hike were AAODC, SOFTA, several major oil companies, a number of equipment manufacturers and suppliers, and seven oil-field trucking companies.

Opposition was based principally on arguments that the inclusion of loading and unloading in distance rates, coupled with the exemption of many commodities from these provisions, would find the shippers often paying for services they didn't receive.

The new charges, opponents argued, would severely increase rig-moving costs and breed constant disputes due to confusion over when dismantling charges ceased and nonchargeable loading services started, and vice versa.

In Louisiana, a hearing on a proposal for sharp increases in oil-field hauling rates has been postponed. The application of the Louisiana Oil Field Carriers Association, Inc., originally set for hearing today, will not be heard before December 15 and perhaps not before the first of the year. The proposal would increase charges for a 20,000-lb., 30-mile move by 40% and provides that carriers would be paid for erecting rigs on a weight rather than an hourly basis.

The AAODC has labeled the proposed new tariff "completely unacceptable" and is organizing vigorously to oppose its adoption.

Along with heavy boosts in line-haul rates, which would include loading and unloading charges, the proposed tariff specifies a new rate base for rig erection and dismantling.

A conventional derrick would be erected for 6 cents per 100 lb. and dismantled for 4 cents per 100 lb., while a jack-knife derrick would be erected for 8 cents and dismantled for 6 cents.

The new line-haul rates, the AAODC contends, would hike trucking costs greatly all along the line—and tremendously on short hauls, where the increases would range as high as 136% of current rates.

AAODC says that under the proposed rates for derrick erection and dismantling, the owner of a big South Louisiana jack-knife rig would be charged roughly $800 for raising of the mast alone.

Though unloading and loading charges ostensibly are included in the line-haul rate, the association is telling its members, a great number of items would be required to pay added hourly loading and unloading rates.

Furthermore, it says, hourly rates for extra trucks and labor would go up 25%, and still more added charges would be imposed for use of low-boy trailers.

Petrochem complex slated in Louisiana

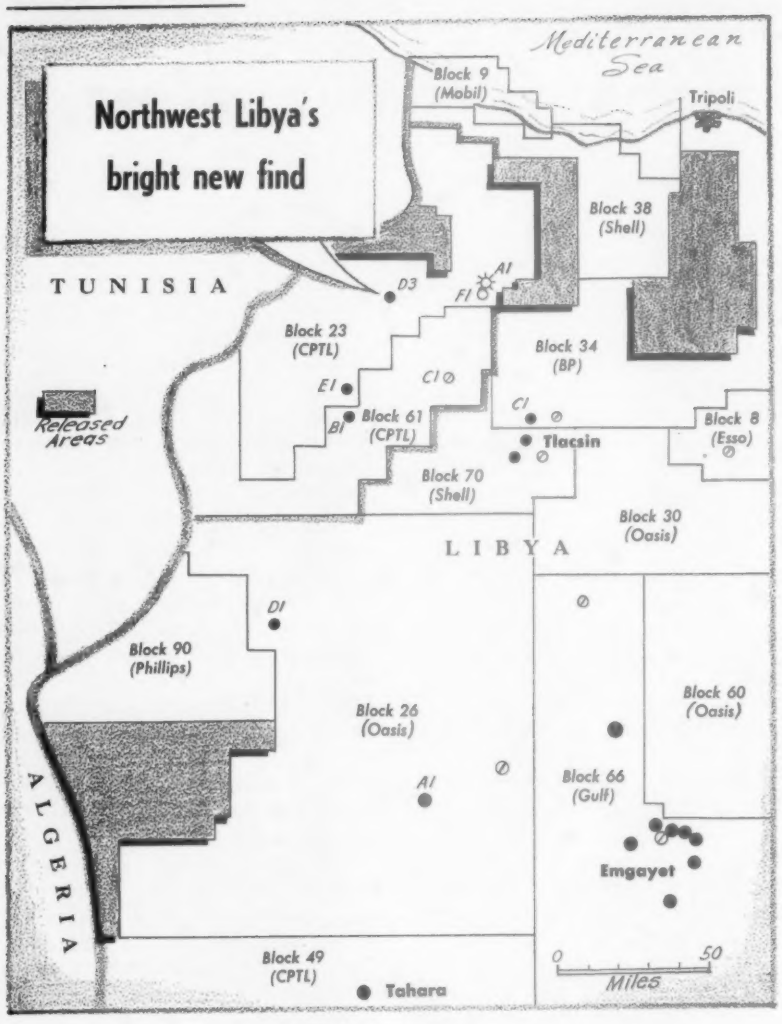
A NEW big petrochemical complex has been announced for Gulf Coast Louisiana, the joint effort of Allied Chemical Corp. and Union Texas Natural Gas Corp.

Exact process route to be undertaken has not been fully decided but feed will consist of 20,000-25,000 bbl. daily of natural gas liquids. Products will include C_5's and heavier aromatics and olefins up to and including butylene. Plans also call for a naphthalene unit.

The $40-$60 million plant will be located near Geismar, about 25 miles south of Baton Rouge. Construction is to be started within 6 months, toward a completion date of mid-1963.

Feed stocks largely will be brought by pipeline and barge from Union's three gas-liquids plants in the area, which have a combined capacity of about 17,000 bbl. daily. A portion of the plant's output will be processed further in units to be installed adjacent to the plant site, or in other Allied plants.

The 50-50 joint undertaking will be known, at least for the time being, as Allied-Union Texas Petrochemicals.



French strike again in Libya

THE exploration play in Northwest Libya has turned brighter, especially for a French company with a 1,187-bbl. daily wildcat discovery about 75 miles from the Mediterranean.

The well, D3 on Block 23, is the third successful well in a row for Cie. des Petroles Total (CPTL) on its two blocks in Northwest Tripolitania. The other wells are El-Block 23, rated at 1,932 bbl. daily, which is about 95 miles from tidewater, and Bl-Block 61, a 1,100-bbl.-daily well, 10 miles south of El.

While work on the acreage still is in the early stages, the three successful wildcats—plus the relatively shallow, 4,000-ft. pay of the well nearest the coast—offer the best hope for commercial output in Western Libya. The 1,187-bbl. flow of 40°-gravity oil in D3 was recorded with a ⅜-in. choke.

CPTL is moving eastward for its next wells on the two blocks. Its Cl-Block 61 is drilling ahead from 3,225 ft., about 30 miles east of El-23. A second rig will move onto a location (F1) about 30 miles east of the D3 well.

Other companies. Discoveries have been plentiful in western Libya, but the wells for the most part are rated at less than 1,000 bbl. daily.

The nearest drilling to the CPTL area is being done by Shell, which is spudding a well east of its two producers at Tlacsin on Block 70. Immediately north of Tlacsin on Block 34, D'Arcy (British Petroleum) is drilling ahead at 8,835 ft. in a well 8 miles east of its first discovery in Libya.

Gulf is running two rigs on Block 66. One well is in the Emgayet area, where six of the company's eight wells are located. It is working over at 6,622 ft. Another rig is drilling ahead at 6,800 ft. in the north.

Oasis has two rigs in the area. One is drilling ahead at 10,000 ft. in a Block 26 test. The other is on the eastern side of Block 60 (not shown on map).

Gulf stakes location for 8,000-ft. wildcat in northern Panama

GULF Oil plans a deep wildcat in northern Panama on a tract of acreage the company once held jointly with Union Oil Co.

The first test, Soledad 1, will be only a mile south of the Sixaola River, which is the boundary between Costa Rica and Panama. The site is about 25 miles inland from Puerto Vargas, Costa Rica.

The 8,000-ft. test will be drilled by Kerr-McGee Oil Industries.

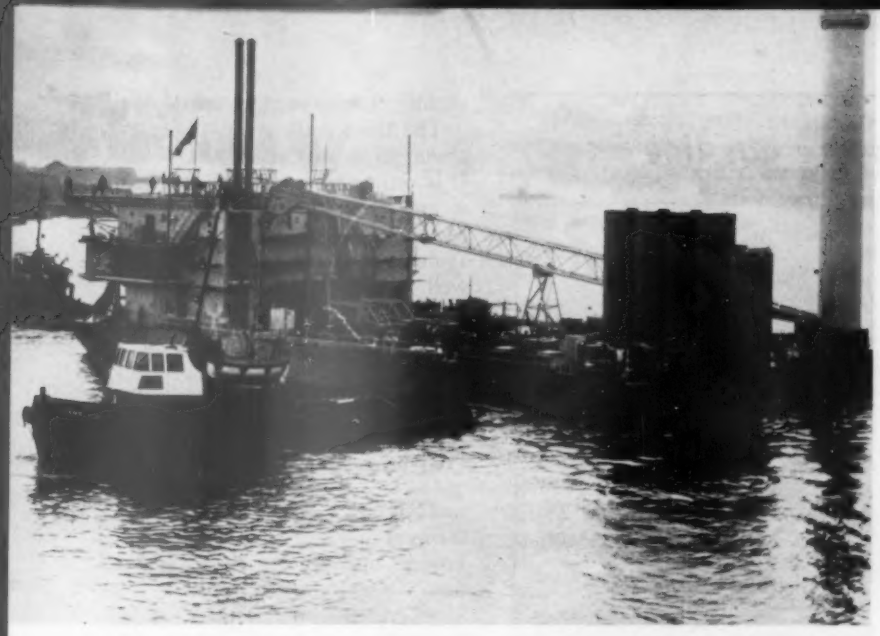
Neither Panama nor Costa Rica has yielded commercial oil.

Foreign Briefs

Wildcats have been spudded at Kharg and Qeshm islands in the Persian Gulf by Iranian Oil Exploration & Producing Co., an operating company for the consortium group. The Kharg test, projected to 14,000 ft., is on the opposite side of the island from the new tanker terminal. The test on Qeshm, located at the entrance to the Persian Gulf, is projected to 15,000 ft.

A carbon tetrachloride plant designed by Scientific Design Co. will be built by Imperial Chemical Industries of Australia and New Zealand, Ltd., at Botany, New South Wales. Completion is scheduled for late 1962.

ENI may drill in Sicily's offshore waters in the general vicinity of Gulf Oil's Ragusa oil field, the biggest in Italy with an output of about 22,000 bbl. daily. A survey of the area showed the possibility of an



Barge to speed offshore work

A MASSIVE mobile work platform, equipped with a 100-ton crane instead of a drilling platform, will help a British-French company put a marine oil field in the lower Persian Gulf in production by mid-1962.

The self-elevating "Adma Constructor" (above) is the only piece of equipment of its kind in the world. It is similar in basic design to the "Adma Enterprise," a mobile drilling barge already in operation at Umm Shaif field off the coast of Abu Dhabi.

Abu Dhabi Marine Areas, Ltd., owned two-thirds by British Petroleum and one-third by Cie. Francaise des Petroles, has already completed six successful wells in the field. A seventh well, which only produced about 2,000 bbl. daily on test, is not considered commercial.

The joint British-French enterprise plans about 40 wells on the structure at Umm Shaif with 1-mile spacing. A pipeline is already being laid from the underwater field to Das Island, operations headquarters, about 20 miles to the west.

The company plans to begin production in mid-1962 at the rate of about 30,000 bbl. daily. This will be boosted eventually to 120,000 to 150,000 bbl. daily. All production is from the Arab zone and is found at about 9,000 ft.

The new mobile construction barge, which is now being outfitted in a British shipyard, will erect production platforms on the wellheads of tests completed by the Enterprise. The New York barge will also be used in servicing wells with specially designed, hydraulically powered equipment. Its 140-ft. crane can be used for general engineering projects in the entire area.

The work platform, which will perform functions usually reserved for floating tenders or barges in other marine drilling areas of the world, is 195 ft. by 90 ft. and will have four 200-ft. legs, 8 ft. in diameter, supporting the barge 35 ft. above the water surface.

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offshore structure similar to ENI's Gela oil field further west along the coast. The agency's subsidiary, Agip Mineraria, recently completed the fifty-ninth Gela well.

Construction contract for a 20,000-bbl. crude - distillation unit has been awarded by Imperial Chemical Industries, Ltd., to Kellogg International Corp. of London. The British chemical company will use the unit as a source for part of the light distillate naphtha required for its three olefin plants at Wilton, England. Shell - Mex and British Petroleum will supply crude to the plant. Construction will start in the spring of 1962 on the north bank of the River Tees. Full operation is planned for 1963.

Licensing agreements have been made by Montecatini with six Japanese companies to produce "isotactic" polypropylene plastic and fiber. Mitsubishi Petrochemical, Mitsui Chemical Industries, and Sumitomo Chemical will produce the product chiefly for plastics. Mitsubishi Rayon, Toyo Rayon, and Toyo Spinning will produce fibers.

A new LPG firm—Nordisk Gulf-Gas, AS—has been set up to acquire the LPG business of Nordisk Flaskegas, AS, a Danish company. Main source of supply for the new Danish-American affiliate eventually will be Gulf Oil's refinery under construction at Stigsnaes, Denmark.

Two new concessions in Mauritania have been awarded British Petroleum. BP has acquired half interest in the 580 - sq. - mile Hassi Fokra area, next door to BP's Hassi Labbar permit acreage in the French Sahara. The other concession is the 1,200-sq.-mile Daiet El Aam permit, also in northern Mauritania.

First deep wildcat in the Spanish Sahara has been abandoned as a dry hole. Union Oil Co. took the Daora 1-1 to 13,910 ft. before plugging. The test was in Block 1 about 2½ miles east of the Atlantic Coast and a few miles south of the Moroccan border (OGJ, March 6, p. 102). The rig has been moved about 25 miles southeast of a second test.

Noncommercial oil shows were encountered in the first North Sea wildcat drilled off the coast of the Netherlands by NAM, a joint Jersey Standard-Shell Co. Drilling operations were suspended for the winter after the test, Kigkbuin C, was taken to 6,000 ft.

Iran's revenue from 1961 exports of products from Abadan refinery will be based on a 10% uplift under a new agreement between the consortium group and National Iranian Oil Co. "Uplift" is a value added to posted prices for the purpose of figuring government payments, and is revised from year to year. Last year's uplift was 12%. In 1959 it was 10%, and was 5% under the original 1954 agreement.

Work starts on big Japanese gas line

CONSTRUCTION has started on a $14-million, 210-mile pipeline system that will move natural gas from Kubiki field to Tokyo.

The line will move 17,500 M.c.f. daily from Teikoku Oil's field, in Niigata Prefecture, into the Tokyo Gas town-gas system. Gas will be cut from 1,100 to 480 B.t.u. before delivery to customers, making the supply equivalent to 48,000 M.c.f. daily. This will account for about one-quarter of Tokyo Gas' present supply.

The first 190-mile, 12½-in. section to Soka will operate at 710 psi. at the field, with pressure dropping to 140 psi. at Soka. Sixteen-in. diameter pipe will be used for the final 20-mile section. This is designed for a pressure drop from 135 psi. to 28 psi. at Toyosu storage point.

Completion date of the system is set for October 1962.

Teikoku Oil found gas at Kubiki last year. The initial well came in as a 35,000 - M.c.f. - daily discovery, nearly doubling the country's gas supply (OGJ, Feb. 22, 1960, p. 85). Since then, the company has been seeking a market for the new supply, either as town gas or as a petrochemical feedstock.

Formosa grants exploration rights

AN OKLAHOMA company will explore on Formosa under a newly signed agreement with the Nationalist Chinese.

The contracts signed by Jerome S. N. Hu, president of Chinese Petroleum Corp., a government company, and James I. C. Chiang, chairman of Asiatic-American, Inc., of Oklahoma City, give Asiatic-American prospecting rights on the island.

Asiatic-American agrees to invest $1-million a year under the 20-year agreement, which has a 20-year renewal clause.

Any commercial oil will be purchased by Chinese Petroleum, Asiatic-American will net 43.75% of the income, while Chinese Petroleum will take the balance.

Chinese Petroleum now produces 60 to 70 bbl. daily on Formosa from about 30 old wells. Newly-found natural gas will supply a fertilizer plant. The government company will continue to operate its own program on the island, side by side with the American group.

Chiang and K. Davis, vice president of Asiatic-American, are based in Marshall, Tex.

Mecom gets dry hole in Yemen but spuds two new wildcats

JOHN W. Mecom, Houston independent, has drilled one dry hole in Yemen and is currently drilling two additional tests in the small Red Sea kingdom at the foot of the Arabian peninsula.

Mecom's first test, in a salt dome near the coastal town of Salif, went to about 5,000 ft. The 2 Salif was spudded about 1 mile east and slightly south of the initial well.

The third well is the 1 Zedieye, about 15 miles east of the 1 Salif. It is projected to 12,000 or 13,000 ft. and is outside the salt dome area. Mecom's Houston office reported some indication of shows in the well.

Stanvac installing data-processing in overseas offices

THE FIRST electronic data-processing system in Southeast Asia is now in operation in Standard-Vacuum Co.'s Bombay offices.

The system will replace electric accounting machines in keeping records and making statistical analyses.

The Indian installation will be followed by an identical setup at Cape Town, South Africa, which is already under way. Before the end of this year another will be installed in Melbourne, Australia. A fourth will be put in operation at Sungei Gerong, Indonesia, before the middle of next year.

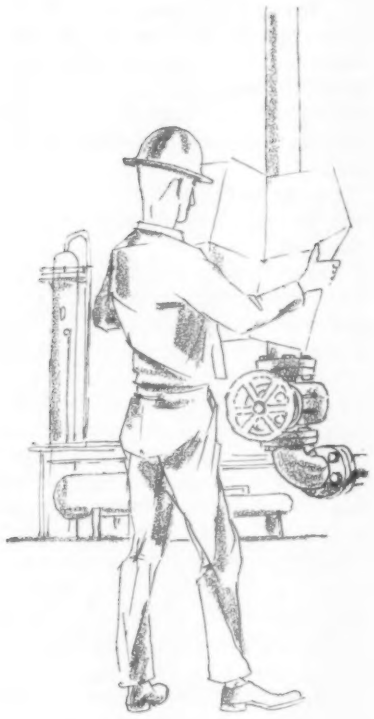
All four are IBM-1401 systems consisting of a card reader and puncher, a processing computer, a printer, and magnetic - tape units. With a card-reading speed of 850 a minute, a printing speed of 600 lines a minute, and magnetic-tape-data-handling capacity of 2½ million digits a minute, the new systems will hand Stanvac management essential information much faster than the electrical accounting machines now in use.

Stanvac first started using mechanical data processing almost 10 years ago with an IBM card and sorter system in Bombay. Later this same system was put in operation in 19 other field offices in Asia, Africa, and Australasia.

To set up the new Bombay installation, Stanvac organized a team of employes from Indonesia, Australia, and India. The trio was trained at IBM's training center in New York and then joined specialists from Stanvac's White Plains headquarters to put the Bombay units in operation.

This team will also take part in getting the Melbourne and Sungei Gerong systems in operation.

Technology



PLANT STARTUP

Getting off to a smooth, safe start is a matter of thorough and painstaking attention to a myriad of details. Here's a discussion that should help you over this critical period.

BY J. A. RICHARDSON
Barry & Richardson,
Calgary, Alta.

Presented at a meeting of the Canadian Natural Gas Processing Association in Edmonton, Alta., September 1961.

MANY special problems are encountered during a gas-processing-plant startup. Whether the plant is large or small, common problems exist. This applies over the entire range from a major highly staffed plant processing sour condensate and acid gas, to a small unattended unit processing sweet gas. But generally speaking, the ease of plant startup and the efficiency of operation are directly dependent on how well the plant was engineered in the beginning, how closely the construction contractor followed the design, and how well the specified equipment performs.

Startup Procedure

Preparing for operation. Every plant has its own individual characteristics with which the staff must become familiar. The operator should not underestimate the need for adequately training his personnel in the operation of this particular plant. Since startup is perhaps the most hazardous time in the life of the plant operation, all personnel should be thoroughly trained in plant safety procedures. Operator should not consent to the startup of a plant before it is completed and thoroughly checked out by his own staff.

Preparation of a plant for operation usually takes place immediately after mechanical testing of the equipment is completed. It is not practical to give a list for prechecking that will cover all plants. Some of the main requirements which are common to many units will be mentioned. Application of these suggestions can prevent many headaches, equipment damage, and initial operating problems.

Purge and flush. After hydrostatic testing, liquids should be thoroughly drained from all low places in the system. It is then desirable to purge air from the entire processing plant with sweet gas and vent to flare. Needless to say, it is preferable not to light the plant flare until after the gas-air mixture is below the explosive limit.

For systems which will operate at temperatures within the hydrate or freezing range, it is desirable to inject and flush piping and equipment with alcohol to remove the last traces of water. This is particularly necessary in refrigeration systems since hydrate formation can cause extensive difficulties and delays. Inadequate water removal is perhaps the major difficulty in initial operation of low-temperature plants.

The plant fuel system should be thoroughly inspected prior to startup to be sure proper winterization has been provided and that there is adequate protection against carryover of entrained water or condensed hydrocarbons.

Chemical systems should be checked out to see that drain valves are tight. Amine systems should be thoroughly cleaned by circulating a dilute soda ash solution. This will clean rust from the piping and equipment. It will also save filter changes which would be necessary to condition the amine for acceptable operation.

Piping on field gas systems going to compressors should be very thoroughly cleaned to avoid breakage of valves and scoring of cylinders. Large volumes of air or gas should be blown backward to all of the originating points in the field.

Bringing units on stream. Most experienced people have their own way of bringing units on stream. In any case, the particular methods and sequence of operations should be planned for any particular plant by the staffs of both contractor and operator. The following discussions offer suggestions for plant startup. However, it is rather hazardous to generalize all requirements to bring a plant on stream.

One safe generalization is that all utilities should be operable before process operation is begun. If the plant has steam-generating facilities, water-treating and boiler plants should be started up. This will provide tracing and heating steam in addition to require process heat. In the absence of a boiler plant, the hot-oil circulating system should be fired up and put into operation, with careful attention being given to oil-temperature levels.

After thoroughly purging all process equipment and piping with sweet gas, and after thoroughly checking to see that the last traces of water are removed, the system should be pressures up, preferably with sweet gas. A final check should be made for leaks at this time.

With gas pressure on the system, it is desirable to start circulation of

chemical-treating facilities such as amine and glycol units. Cooling equipment such as process condensers and coolers should be started prior to application of any heat through reboilers or exchangers.

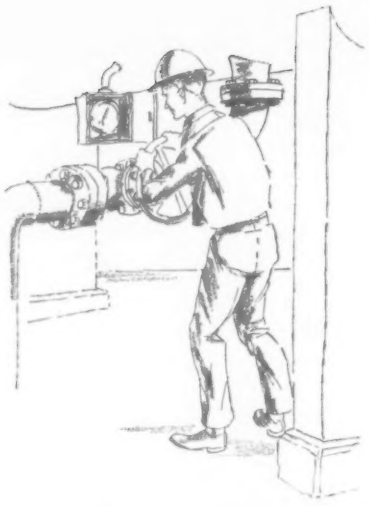
The plant feed stream should be charged first at a low rate to start actual processing operations. Vapor effluent from the plant is generally put to flare until the residue gas is brought to specification. Liquids may be put to a dump tank or other tank for reprocessing. As liquids approach operating levels in various vessels, pumps should be started to charge the liquids to the next processing facility in sequence. When levels have been established in each vessel, process heat should be introduced into the reboiler and temperature levels raised slowly to approach those of the contractor's design conditions. In the case of stabilizers, fractionation columns, and stills, the reflux pumps should be started as soon as sufficient level is obtained in the overhead product accumulator. All pressures, temperatures, and flows should be brought to design conditions very gradually.

It is necessary that compressor engines be carefully watched during loading and that the engine be tuned and balanced after a load has been established.

The refrigeration system is generally the last processing unit to be started up. The importance of removing the last traces of water from this system has previously been emphasized. It is equally important to see that the original charge stock of refrigerant is entirely dry.

The entire system should then be purged with refrigerant to remove the last traces of purge gas, and refrigerant charged into a surge tank. Refrigeration compressors should be started and brought to design conditions while watching liquid levels in the system very closely. It is important that neither high nor low refrigeration levels be developed during the initial startup.

As units are brought on stream, control testing for product quality should be started. These tests are usually outlined in the contractor's startup manual and are generally in accord with procedures given in the booklet "Technical Standards of the Natural Gasoline Association of America."



The plant feed stream should be charged first at a low rate to start actual processing operations. All pressures, temperatures, and flows should be brought to design conditions very gradually.

Initial Operating Problems and Plant Performance

Amine treating units. Amine units are generally put into operation with the use of an aqueous amine solution containing between 12 and 20 wt. % monoethanolamine. To reduce corrosion caused by formation of degradation products, it is believed advisable to maintain the solution strength as low as possible, as long as the ratio of amine to acid gas exceeds a minimum of 2.5 moles per mole. It is also desirable to operate the regenerator at such pressures that bottom temperatures will not exceed 245° to 250° F.

Prestartup cleaning will help to minimize initial operating problems. Difficulties most often experienced in initial operation are inadequate hydrogen sulfide (H_2S) removal and foaming of the amine solution. These two may be related, although inadequate H_2S removal is more often a result of inadequate stripping in the regeneration section. A minimum of 1.2 lb. of stripping steam or equivalent alternate heat to the reboiler for each Imperial gallon of solution circulated is good practice to assure efficient stripping of the lean solution. Greater amounts of stripping steam are required of the amine is to be used in low-pressure contactors.

Foaming of amine solution is most often caused by condensation of hydrocarbons in the system. The most common remedy for foaming is to raise the temperature of the lean amine to the contactor to keep these liquids from condensing. At the same time, a proven foam inhibitor should be injected into the lean-amine solution. Manufacturers' recommendations of quantities should be closely followed, and excessive quantities should not be used.

During initial operation the filter will probably require frequent changing.

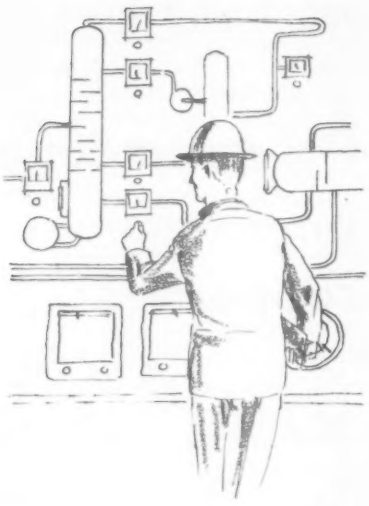
Control tests required for the amine unit are very simple. The concentration of amine is determined by a standard titration usually set up for the operator to run each day. As an operating control test for H_2S in residue gas, a standard lead acetate test is usually used. Residue-gas H_2S concentration should be tested periodically using a cadmium sulfate test procedure. A recording analyzer is sometimes provided and gives a useful comparative analysis. Most recorders need to be standardized and carefully maintained.

Glycol dehydration units. Solution strength for glycol dehydration units varies with the dew-point depression requirements and with the temperature of contact. If a large dew-point depression is required, it is imperative that the glycol be as completely regenerated as possible. In certain units a dry-gas stripping stream is used in addition to very high regeneration temperature to reduce water content in the lean glycol as much as possible.

If the glycol is used in a refrigeration unit, viscosity problems make it impractical to regenerate the glycol solution to a concentration more than 70 to 80%, particularly if the lean glycol is injected into the gas stream ahead of cold exchangers. Glycol units generally give very little initial process trouble. The control test for the hydrocarbon stream is normally a standard Bureau of Mines dew-point tester.

Where glycol dehydration is used for sour gas, a corrosion inhibitor should be considered.

Stabilization units. Initial operation of stabilization columns should be at temperatures and pressures stipulated by contactor's design. Feed rates, control temperature, and



With assistance of control tests, control temperature and reflux quantities should be adjusted to achieve the desired cut point.

reflux quantities should be maintained as constant as possible. It is frequently necessary to adjust the sensitivity and reset for level and temperature controllers in order to dampen fluctuating conditions. Primary control tests for stabilizer units are Reid vapor pressure and API gravity of the bottoms, and a boilaway test of the reflux. With assistance of the control tests, control temperature and reflux quantities should be adjusted to achieve the desired cut point. After such changes are made, adequate time should be allowed for operation to become stable before a second set of tests are taken in order to give a true indication of the effect of new conditions.

For stabilizer units having multipass direct-fired heaters, the heater-effluent temperatures should be carefully regulated to avoid cracking sulfur or hydrocarbon compounds as a result of high tube-wall temperatures.

Fractionation units. During initial operation the main problem encountered in a fractionation column is achieving the required degree of separation between key components. Control tests such as Reid vapor pressure, gravity determinations, and boilaway tests are used to determine the direction of control temperature adjustment and reflux requirements.

A ragged operation may often be smoothed by establishing an optimum control location, either above or below the feed tray. Each fractionator has a specific temperature gradient for each separation. Problems encountered in making a satisfactory separation may be revealed by a plot of temperature versus tray number. The optimum control point for the column is often apparent from such a plot it may be found desirable to change control-point location. Whether a top or bottom control point is preferable is dependent upon the type of cut being made.

Sulfur-recovery plants are generally based on licensed processes wherein licensee assumes full process responsibility. As a result, start-up engineers are most often supplied by licensee. Plant operator's personnel should work closely with these engineers and receive proper training for the particular unit. Operating responsibility for the unit should be accepted only after plant operator is confident that his personnel is adequately trained in operation of his plant.

Performance tests. The operator's plant project engineering job is generally concluded with the acceptance of the plant from the contractor. While a mechanical acceptance may be made prior to process start-up, the unqualified acceptance should not be given until after plant operation has been proved with a complete performance test.

Plant performance tests vary in purpose from a minimum test of only such conditions as are necessary to prove contractor's product quality guarantee, to a comprehensive test to permit an over-all heat and material-balance and performance evaluation.

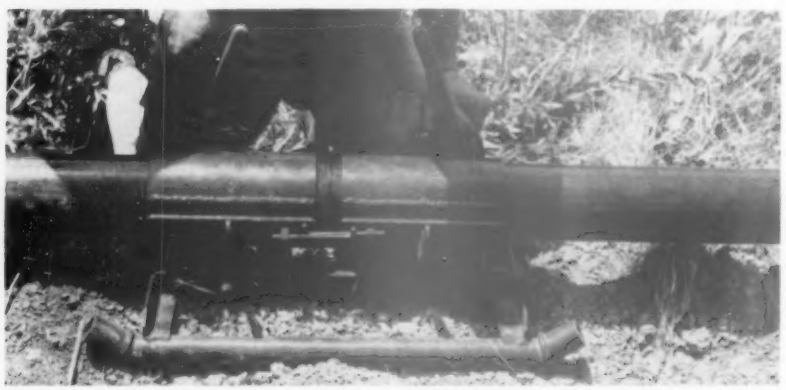
Prudent plant owners usually prefer that the capabilities of their plant be clearly demonstrated and that a comprehensive test be made to evaluate equipment and operation. Such a test should be taken over a period of 12 to 24 hours of steady-state operation as agreed upon between operator and contractor. It should be taken at near design capacity and conditions. Such a test includes periodic readings of all key plant temperatures, pressures, and flow volumes, together with adequate samples to prepare a complete plant heat and material balance. This will not only assure owner that the plant and equipment will meet the contract guarantee, but will provide an invaluable guide for overcoming future operating problems, for trouble shooting on individual equipment operation, and will be a guide for future requirements if an expansion or change of service is contemplated.

Indeed such a test is a vital part of plant startup and initial operation and is as important to future operation as a reliable feed-stream analysis is to design. The plant owner should not consider a plant project complete until his equipment has been so evaluated and his investment protected.

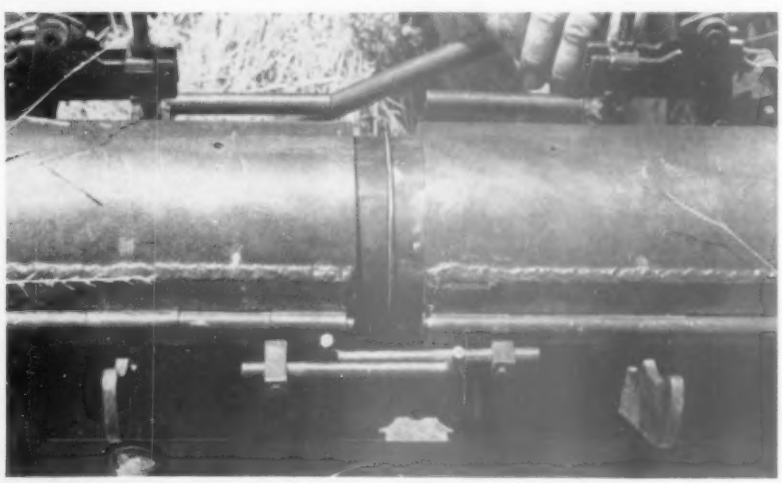
Prudent owners usually prefer that the capabilities of their plant be clearly demonstrated and that a comprehensive test be taken to evaluate equipment and operation.

Polypropylene pipe wins supporters

BUTT WELDING of polypropylene pipe is done in three steps. The first, not shown, is to clean and face the pipe ends. The second, shown above, is to insert a heating element between the pipe ends and hold it there until a 1/16-in. bead forms.



THE THIRD STEP is to withdraw the heating element and press the pipe ends together and hold until cool, about 30 seconds.



RESULT is a joint with about 1/16-in. bead on the inside and outside. Time required to make a complete joint is less than 3 minutes, from moving the equipment to the joint to moving forward to the next joint.

SUPPORTERS of polypropylene pipe claim that their product has come through its first year of field testing with flying colors. The new material is winning its laurels early; it became commercial only 3 years ago.

Oil-field tests include about 10 miles of buried and surface pipe for such services as salt-water disposal, low-pressure gas gathering, and crude-oil flow piping. Chemical-plant tests include overhead pipe for flue gases and acid-wash lines.

The tests, begun in June 1960, show that polypropylene performs well where steel and some other plastics fail, say the manufacturers.

Further, it has received approval for potable water use.

Polypropylene is economical. Total installed costs were about half that of steel in the same service and size. Polypropylene costs are less because it does not need internal and external coatings and cathodic protection that steel does. Also, installation is cheaper because heavy handling equipment is not needed. The base resin sells for 45 cents per pound in commercial quantities.

Polypropylene, the lightest of all plastics, has a specific gravity only an eighth that of steel.

The far-reaching claims for polypropylene were made in a progress report presented by W. F. Oxford, Jr., Alan S. Ahmad, and J. C. Warren of AviSun Corp. in Houston recently at the NACE meeting.

Their progress report was based on pipe extruded from AviSun's Grade 1051 polypropylene, a new, improved pipe-extrusion polymer. AviSun makes the resin at its 100-million-pound-yearly polymer plant at New Castle, Del.

Pipe properties. The properties of polypropylene point toward its use in corrosive low-pressure systems. It is corrosion-resistant and is af-

fected only by chlorinated solvents, concentrated oxidizing acids, and organic solvents. Carbon filling has increased ultraviolet light resistance.

Polypropylene, the strongest of the polyolefins, retains its strength over a wide temperature range, the supporters claim. For example, maximum operating conditions with a 5:1 safety factor for 2-in. schedule-80 wall pipe at 70° F. are 200 psi., and at 160° F. are 96 psi.

Joining is by heat fusion. AviSun picked fusion because it couldn't find an economical solvent for joining. AviSun has developed two techniques of fusion welding, butt welding and socket welding.

Both systems use a heated aluminum element to melt the pipe ends that are to be joined. After heating, the element is removed and the pipe ends are pressed together until the joint cools to ambient temperature. A joint can be completed in less than 3 minutes by two men.

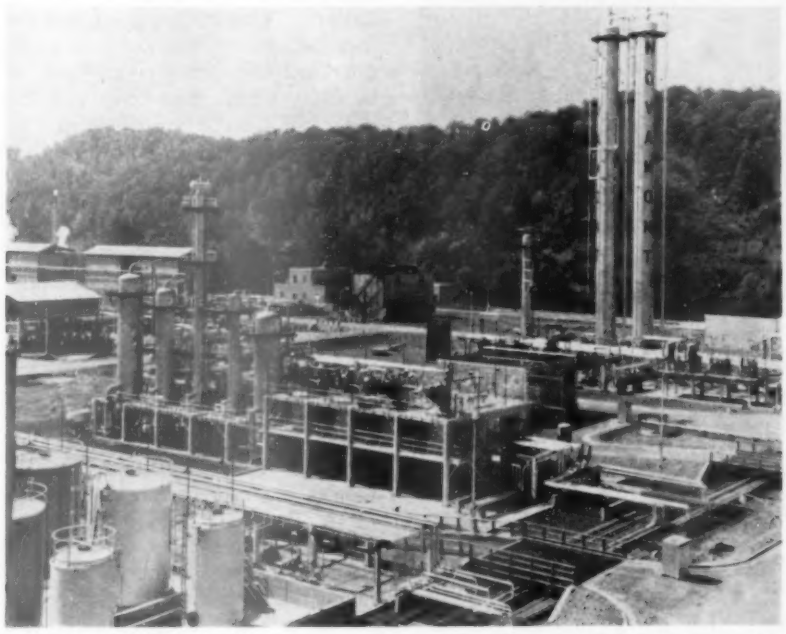
Polypropylene pipe's market will be for low-pressure systems which are corrosive to steel. AviSun expects to sell about 1 million pounds of polypropylene pipe this year. In about 5 years, AviSun feels the market will grow to about 20 million pounds yearly.

AviSun believes its polypropylene pipe, with high tensile and impact strengths at operating conditions, will capture a good share of this market. Polypropylene pipe made from AviSun's new resin has the highest molecular weight available at present.

All of polypropylene pipe's problems are not solved, however. There is still the need to improve impact strength at low temperatures, to increase flammability resistance, and to improve long-term high-temperature properties.

Modifying the base polymer or compounding with other materials can improve these properties. Specific grades of polypropylene are being field-tested now.

Even with these limitations the supporters claim that polypropylene is still an attractive pipe compound.



NOVAMONT CORP.'S new isotactic polypropylene plant at Neal, W. Va., on Big Sandy River. The plant was officially brought on stream on October 25. Novamont Corp. is the wholly owned American manufacturing subsidiary of Montecatini of Milan, Italy.

Polypropylene plant goes on stream

IN WEST VIRGINIA, Novamont Corp.'s Neal polypropylene plant was dedicated and placed on stream late last month.

The new plant, located on a 200-acre site on the Big Sandy River near Huntington, can produce 30 million pounds annually of isotatic polypropylene for plastic applications. Distillation columns and general utilities, already built, are enough to enable the company to double polypropylene output.

Film plant. Novamont will build a plant in 1962 to manufacture films from isotatic polypropylene resin produced at the Neal plant. Capacity of the new film plant, to be located on the same site at Neal, is expected to be more than one million pounds per month. Design of the new Novamont film plant is currently being done in Italy. American contractors will be employed for the construction of the plant.

Novamont Corp. is the American subsidiary of Montecatini of Italy, which has headquarters in Milan. The Neal plant is the company's first manufacturing plant in the United States although it has supplied its know-how for six installations to American companies under license agreements covering various Montecatini processes.

Iowa road to take big quantities of petroleum products

MORE THAN 6,300,000 gal. of petroleum products will be used on a single 8-mile section of asphalt-paved interstate highway in Iowa. Located on Interstate Route 80 between Davenport and Iowa City, the new stretch was let to contract in late July.

The 8.1 miles of four-lane pavement will require:

An estimated 1,000,000 gal. of fuel oil for the aggregate-drying operation alone.

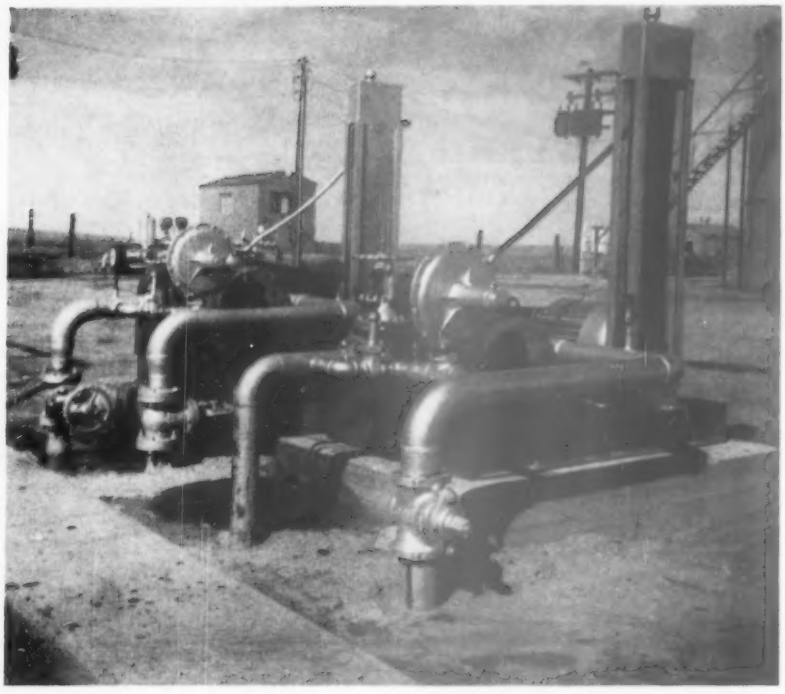
A half-million gallons of gasoline, lubricating oil, grease, and diesel fuel for trucks, rollers, and other construction equipment.

More than 4,800,000 gal. of asphalt.

The pavement design calls for a total of 20½ in. of hot-mix asphalt laid directly on the soil subgrade. The shoulders will consist of 8 in. of plant-mix topped with a ¾-in. asphalt armor coat.

By the time the job is completed in August 1962, it will have used 402,319 tons of hot asphalt mixture.

This $2,000,000 project is a graphic illustration of the market-making potential of asphalt-road construction.



ONE OF FIVE different compressor types used in the vapor-recovery program in the Denver basin. Note the cooling radiators on this belt-driven, sliding-vane type of unit. Unit is located at Plum Bush Creek unit.

There's profit in those stock-tank vapors

Denver basin fields produce enough gas with a high liquid content to make conservation pay off.

BY T. R. BLEVINS and F. G. VAN MATRE
Continental Oil Co.

STRATEGIC LOCATION of gasoline plants in the Denver basin have provided a market for large volumes of rich stock-tank vapors.

By installing small skid-mounted compressors to gather, compress, and inject these rich vapors into the gathering system, Continental Oil Co., operator of Little Beaver gas plant, has been able to practice conservation as well as to substantially increase revenue to both gasoline plant and producer.

Presented at NGPA meeting, Billings, September 1961 under the title "Lease Stock Tank Vapor Conservation."

Continental made the first installation at the Little Beaver "D" Sand unit LACT stock tank in October 1960. Four additional installations were made through February 1961, at the Big Beaver, Plum Bush Creek unit, Little Beaver East unit and Kejr unit batteries.

The installations process from 43 M.c.f.d. to 640 M.c.f.d. with oil production at the batteries ranging from 1,200 to 9,100 bbl. per day.

Evaluations of a vapor-recovery installation is made by:

- Measuring the volume of stock-tank vapor available on the lease.
- Testing the vapor to find the number of gallons of liquid recovery per 1 M.c.f. of vapor.
- Studying the economic outlook, based on the casing-head gas contract and the estimated cost of the vapor-recovery installation.

Equipment

All five installations made by Continental in the Denver basin have high-speed (over 600-r.p.m.) positive-displacement, single-stage, rotary compressors driven by electric motors. Three different makes are included; two sliding-vane types and one double-impeller type. Two of the makes have belt drive and the other is directly coupled to the motor. One type compressor is equipped with a suction scrubber. A second type includes a jacket water cooler and radiator.

All installations are equipped with bourdon - tube - type pressure shut-down controls and/or automatic by-passes to prevent pulling a vacuum on any vessel.

All fields in which vapor-recovery equipment is installed are electrified, and electric-motor prime movers are used for the compressors. Electric motors are also preferable because of the fact that residue gas is not available in all cases. The use of rich lease gas as a fuel is not economically attractive and it creates

Table 2

Producers' income:
Liquids
Gross gas × g.p.m. × liquids returned (0.25) × net interest (0.875) × liquids price per gallon.
Residue gas
Gross gas × residue gas returned (0.50) × net interest (0.875) × net after shrink (0.65) × price per M.c.f.

Plant income:
Liquids
Gross gas × g.p.m. × liquids (0.75) × liquid price per gallon.
Residue gas
Gross gas × residue gas (0.50) × net after shrink (0.65) × price per M.c.f.

Table 1—Equipment, operating conditions, and costs of Little Beaver installations

Area	Type installed	Production bbl. per day	Capacity M.s.c.f.d. Design	Capacity M.s.c.f.d. Actual	Pressures psig. Suction	Pressures psig. Discharge	Gas gravity	Hp.	Installed cost	$/Hp.
LBDSU	Sliding-vane direct drive	2,000	100	88	4 oz.	8	1.900	5	1,975	395
Big Beaver	Sliding-vane direct drive	1,900	415	415	15	39	1.335	30	3,980	133
PBCU	Sliding-vane belt drive	9,100	250	210	4 oz.	24	1.710	20	4,450	222
			400	430	4 oz.	24	1.365	30	5,300	177
LBEU	Double-impeller belt drive	1,200	50	43	4 oz.	7	1.840	5	620	124
KEJR unit	Double-impeller belt drive	1,200	50	48	4 oz.	7	1.775	5	620	124

additional operating problems during cold weather.

Present installations. Table 1 describes the equipment, operating conditions, and costs of the compressor installations made by the Little Beaver gas plant.

Relationship between cost per installed horsepower and capacity is shown in Fig. 1. Note that costs have varied widely. But, cost was not necessarily the deciding factor in Continental's installations, since it was advantageous to gain operating experience with the three different makes of units to aid in future operations. Availability of equipment was also considered in the installations.

Payout Data

A sample payout formula and calculations of the payout for the gas plant and income to the primary oil producer are shown in Tables 2, 3, 4, and 5. For purposes of these sample calculations, it was assumed that 25% of the liquids and 50% of the residue gas were credited back to the producing lease. This assumption conforms closely with actual figures for the Little Beaver gas plant. Prices used for residue gas and liquid products were taken from actual 1960 figures at the Little Beaver plant. Shrinkage of 35% is also realistic for this plant.

It should be noted that the gas plant installed the vapor-recovery equipment in these five fields. The primary oil producer in these cases receives from $390 to $3,795 per month with no additional investment. It is therefore to the economic advantage of both the producer and gas plant to investigate every producing lease for possible vapor-recovery applications.

Installation Operation and Maintenance

All units are skid-mounted and have been placed on concrete foundations 4 in. thick. The foundation provides a level surface and a hold-down, although very little vibration has occurred.

If it is anticipated that liquid might enter the compressor, inlet scrubbers should be installed with automatic dumps. We found insulation of the scrubber and dump valve necessary to prevent freezing. Mist or minute drops of liquid will not affect the compressors, but liquid slugs will damage the vanes or impellers.

Extreme care should be taken to insure that no air enters the system through thief hatches on the stock tanks. This can be accomplished by mounting a pressure control switch directly on the tank or by providing a bypass to maintain a predetermined inlet pressure. The automatic bypass is especially applicable for multiple stock tanks manifolded together.

One of the direct-drive compres-

Table 3—Little Beaver "D" sand unit

PLANT DATA

Costs:	
Investment	$1,525
Installation	450
Operating expense per month	30
Total	$2,005
Income:	
Gas volume—LACT	88 M.s.c.f.d.
Test content	25.0 g.p.m.
Average price—LPG	4.5 cents per gallon
Residue gas	16.0 cents per M.s.c.f.
Gross income—LPG	$2,250 per month
Gross income—Residue gas	140 per month
Total	$2,390 per month
Payout period before taxes and depreciation	0.8 month

PRODUCER DATA

Costs:	.$ 0
Income (after royalty):	
Gas volume	88 M.s.c.f.d.
Test content	25.0 g.p.m.
Average price—LPG	4.5 cents per gallon
Residue gas	14.0 cents per M.c.f.
Gross income—LPG	$660 per month
Gross income—Residue gas	105 per month
Total	$765 per month

Table 4—PBCU field

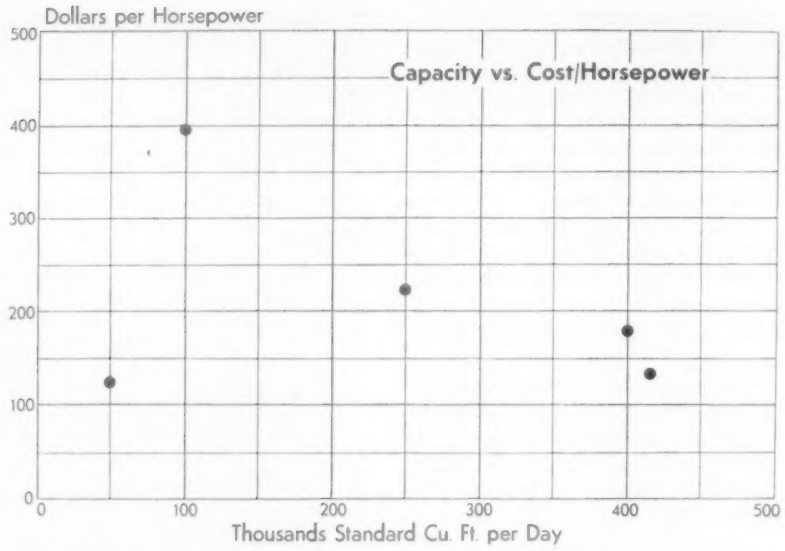
PLANT DATA

Costs:	
Investment	$8,750
Installation	1,020
Operating expense per month	230
Total	$10,000
Income:	
Gas volume—LACT	210 M.c.f.d.
Gas volume—treater	430 M.c.f.d.
Test content—LACT vapors	27.8 g.p.m.
Test content—treater vapors	9.9 g.p.m.
Average price—LPG	4.5 cents per gallon
Residue gas	16.0 cents per M.c.f.
Gross income—LPG	$10,355 per month
Gross income—residue gas	1,010 per month
Total income	$11,365 per month
Payout period—before taxes and depreciation	0.9 month

PRODUCER DATA

Costs:	
Income (after royalty):	
Gas volume—LACT	210 M.c.f.d.
Gas volume—treater	430 M.c.f.d.
Test content—LACT vapors	27.8 g.p.m.
Test content—treater vapors	9.9 g.p.m.
Average price—total LPG	4.5 cents per gallon
Residue gas	16 cents per M.c.f.
Gross income—LPG	$3,020 per month
Gross income—residue gas	775 per month
Total income	$3,795 per month

AUTOMATIC CONTROLS and suction scrubber are included with this compressor, part of the vapor-recovery system at Little Beaver "D" Sand unit.



SCATTERING OF POINTS on this capacity-vs.-cost per installed horsepower relationship is due to the use of different types of compressors at various locations feeding gas to the Little Beaver gas plant. Availability of equipment plus a desire to gain experience with different compressor types prompted this action.

sors failed because of misalignment when the unit was fabricated. The belt drive units offer more flexibility than the direct-drive units because the speed can be adjusted to meet present load conditions, and alignment is not critical.

It has been necessary to flush the steel-vaned compressors once a month with kerosine to remove sludge and prevent sticking. However, all vane-type compressors are cleaned at regular intervals to insure freedom of movement of the vanes.

The oil consumption on the vane-type compressors has averaged a quart per 24 hours.

The compressors equipped with timing gears immersed in an oil bath have a bearing seal between the impellers and gears. Some gas leakage has occurred through the bearing seal and contaminated the oil bath. This has resulted in two bearing failures and one timing gear failure. These failures in turn caused extreme impeller and housing wear.

The fiber-bakelite vane compressor appears to be the most efficient at present, possibly due to a better seating surface to the rotor housing.

Selection of the proper safety controls and a good preventive-maintenance program are vital for successful and trouble-free operations.

Conclusions

In addition to conserving stock-tank vapors formerly vented to atmosphere, the five vapor-recovery installations in the Fort Morgan area are providing a gross monthly revenue of $29,440 to the primary producer and the Little Beaver gas plant.

Since there have been no major operating or maintenance problems to date, it is concluded that the high-speed (over 600-r.p.m.) displacement centrifugal compressors are very satisfactory for continuous, full-load operations involving high-liquid-content gases.

The attractive economics and successful operations of these units has initiated a complete survey of Continental's entire producing operations in the Rocky Mountain area for possible additional installations.

Table 5—Little Beaver East unit

PLANT DATA

Costs:	
Investment	$ 470
Installation	150
Operating expense per month	30
Total	$ 650
Income:	
Gas volume—LACT	43 M.c.f.d.
Test content	26.5 g.p.m.
Average price—LPG	4.5 cents per gallon
Residue gas	16.0 cents per M.c.f.
Gross income—LPG	$1,170 per month
Gross income—residue gas	70 per month
Total	$1,240 per month
Payout period before taxes and depreciation	0.5 month

PRODUCER DATA

Costs:	
Income (after royalty):	
Gas volume—LACT	43 M.c.f.d.
Test content—LACT	26.5 g.p.m.
Average price—LPG	4.5 cents per gallon
Residue gas	14.0 cents per M.c.f.
Gross income—LPG	$340 per month
Gross income—residue gas	50 per month
Total	$390 per month

Acknowledgment

The authors express appreciation to Continental Oil Co., and the working interest owners of the Little Beaver gas plant, Bankers Life & Casualty Co., Calstar Petroleum Co., Denver Basin Oil Co., P. H. Greer Co., Lion Oil Co., Sinclair Oil & Gas Co., Sunset International Petroleum Corp., and Triangle "J" Oil Co. for permission to publish this paper. Special thanks also go to B. E. Anderson for his assistance in preparing the paper.

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Pneumatic analog computing

—it may find an application in your plant

Thus far, the author points out, theory outstrips practice in this field. However, users may soon be focusing greater attention on the comparatively inexpensive special-purpose analog computers. The popularity of this approach may increase when it is more widely recognized that the application of analog computers and adaptive optimalizers requires the use of very little high-powered mathematics.

Greater-than-normal accuracy may be required in some analog systems this is obtainable by: (1) Use of more highly amplified suppressed-range signals, and (2) use of larger signal ranges than the standard 3 to 15 psi.

BY C. L. MAMZIC
Manager, application engineering
Moore Products Co.

PNEUMATIC COMPONENTS of proved high reliability and low cost are now available to perform all the basic analog computing operations. Two new computing components — linearized pneumatic relays for differentiation and integration—and a new pneumatic optimalizing controller give added versatility to the field of analog computing.

Many of the available components have been applied on continuous processes in countless applications, though not in what might generally be recognized as analog-computing circuits. The advantages of pneumatic - analog - computing systems, particularly for in-process applications, cannot be overlooked. These are: (1) Components of proved reliability, (2) wide selection of components, and (3) low cost.

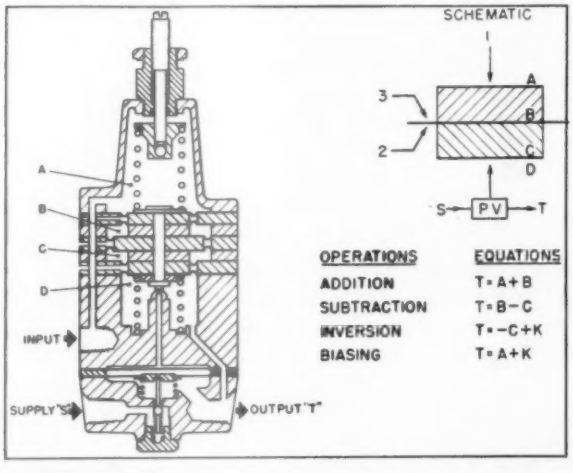
Typical pneumatic computing hardware, classified according to computing function, is described in the following sections.

Addition and subtraction. Two basic computing relays perform addition and subtraction—the pneumatic - force - balance type, Fig. 1, and the mechanical - force - balance type, Fig. 2. In Fig. 1, a signal pressure in chamber A acts downward on a diaphragm with a unit effective area. A signal pressure in chamber B also acts downward on an annular diaphragm construction, also having an effective area of unity. In the same manner, the signal pressures in chambers C and D likewise act upward on unit effective area diaphragms. Spring force is adjustable over a full range of forces, positive through negative.

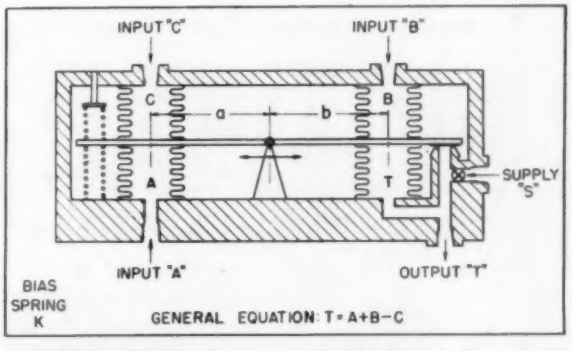
Any unbalance in forces moves the diaphragm assembly with its integral nozzle seat. The change in nozzle-seat clearance with respect to the detecting nozzle changes the output pressure acting in chamber D until force balance is restored. The basic equation which describes the operation of the relay is:

$$T = A + B - C \pm K$$

In the mechanical computing relay, Fig. 2, each of the bellows has the same effective area. Relay output pressure acts on bellows T. Pressure in chambers A and B increases the output while pressure in chamber D decreases the output. The output pressure is changed to maintain all forces in balance. Spring force is adjustable over a full range of forces, as with relay, Fig. 1. The basic equation for this relay is:



COMPUTING RELAY of the pneumatic force-balance type. Fig. 1.



COMPUTING RELAY of the mechanical force-balance type. Fig. 2.

$$T = \frac{a}{b}(A - C) + B \pm K$$

If the lever ratio is unity, the equation can be expressed:

$$T = A + B - C \pm K$$

(same as Fig. 1 relay)

Addition of two variables can be performed by both relays when the variables are connected to the A and B chambers. Subtraction is obtained by connecting the minuend to either chamber A or B, and the subtrahend to chamber C.

Inversion. A signal can be inverted, or reversed, in relays Figs. 1 and 2 by having it load chamber C while the zero springs are adjusted for the proper positive suppression. If, for example, a 3-15-psi. signal is to be inverted to a 15-3-psi. signal, the zero springs would be adjusted for a positive suppression, to make the output 15 psi. for a 3-psi. input (18-psi. positive suppression).

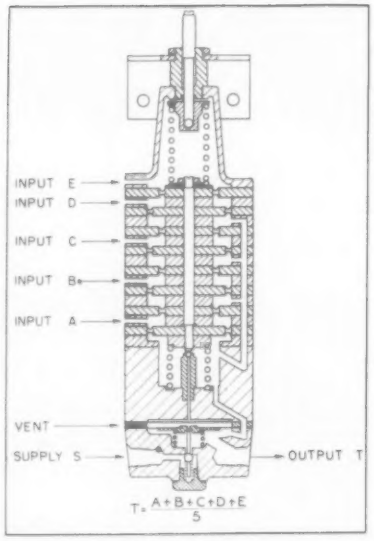
The equation covering this operation is:

$$T = K - C$$

Multiple addition. From three to six variables can be added in computing relay, Fig. 3. This unit is similar to relay, Fig. 1, except that more diaphragms are added to the diaphragm stack, to provide additional input chambers and output feedback chambers.

The particular relay shown in Fig. 3 sums all the inputs and provides an output equal to the average input signal. The averaging feature is especially desirable in analog computing—as all of the signals, input and output, are maintained in the same standard range without requiring special scaling of signals. The equation covering the operation of the relay is:

$$T = \frac{A + B + C + D + E}{5} \pm K$$



THREE TO SIX VARIABLES can be added in this computing relay. Fig. 3.

Multiplication and division of two variables. A commonly used multiplier-divider is the Sorteberg Force Bridge shown in Fig. 4. Input pressures act on bellows in chambers A, B, and D. The output is a feedback pressure in chamber C. The bridge consists of two weigh-beams which pivot on a common movable fulcrum, with each beam operating a separate feedback loop. Any unbalance in moments on the left-hand beam causes a movement of the fulcrum position until a moment-balance is restored.

An unbalance in moments on the right-hand beam results in a change in output pressure until balance is restored. Equations which characterize the operation of the force-bridge are:

$$A \times a = B \times b$$

$$\text{and } D \times a = C \times b$$

The equation reduces to:

$$A \times C = B \times D,$$

or:

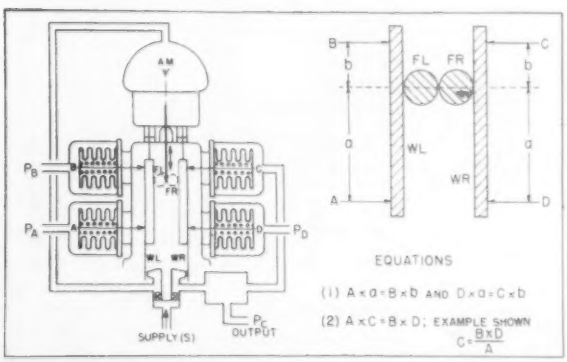
$$C = \frac{B \times D}{A}$$

Multiplication results when the two input variables are connected to chambers B and D. Division results when the dividend is connected to either chambers B or D, with the divisor connected to A. Simultaneous multiplication and division results when B, D, and A chambers are used.

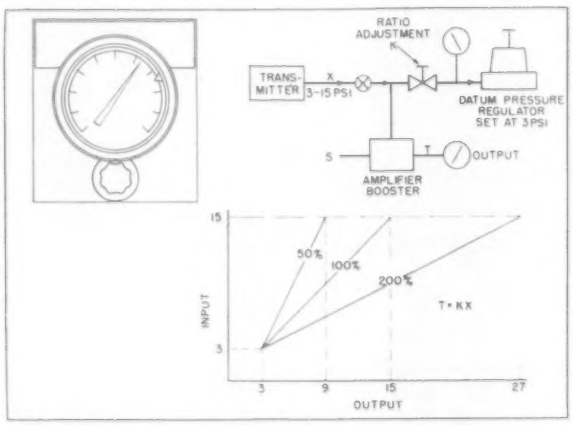
Also available are multiplier-dividers similar to relay Fig. 2, but having a pneumatically-adjusted fulcrum. More recently, a vector-balance multiplier-divider has been introduced. One variable changes the vector angle through an open-loop adjustment, while the other variable serves as an input to the force-balance transmitter.

One possible advantage of some of the latter-type multiplier-dividers is that suppressed range signals representing variables such as pressure and temperature can be used where a pure multiplier-divider such as the Sorteberg force bridge requires inputs proportional to absolute values of these variables.

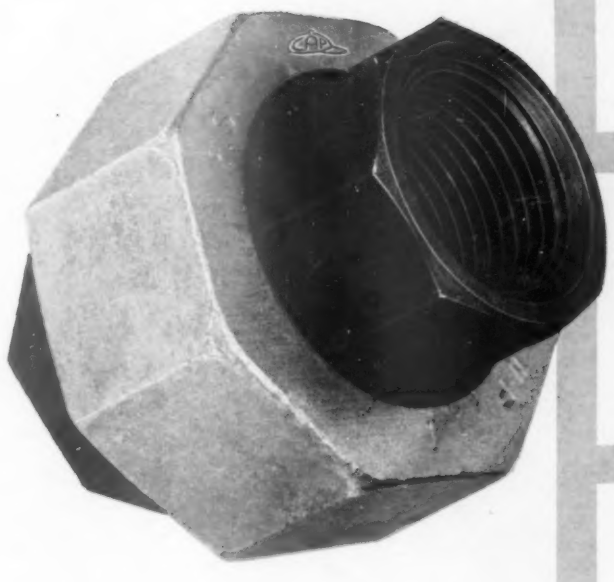
Multiplication by a constant (scaling). Three components which can



SORTEBERG FORCE BRIDGE for multiplication, division, and square-root extraction. Fig. 4.



RATIO RELAY includes a scaling adjustment on front panel and input-output gage. Fig. 5.



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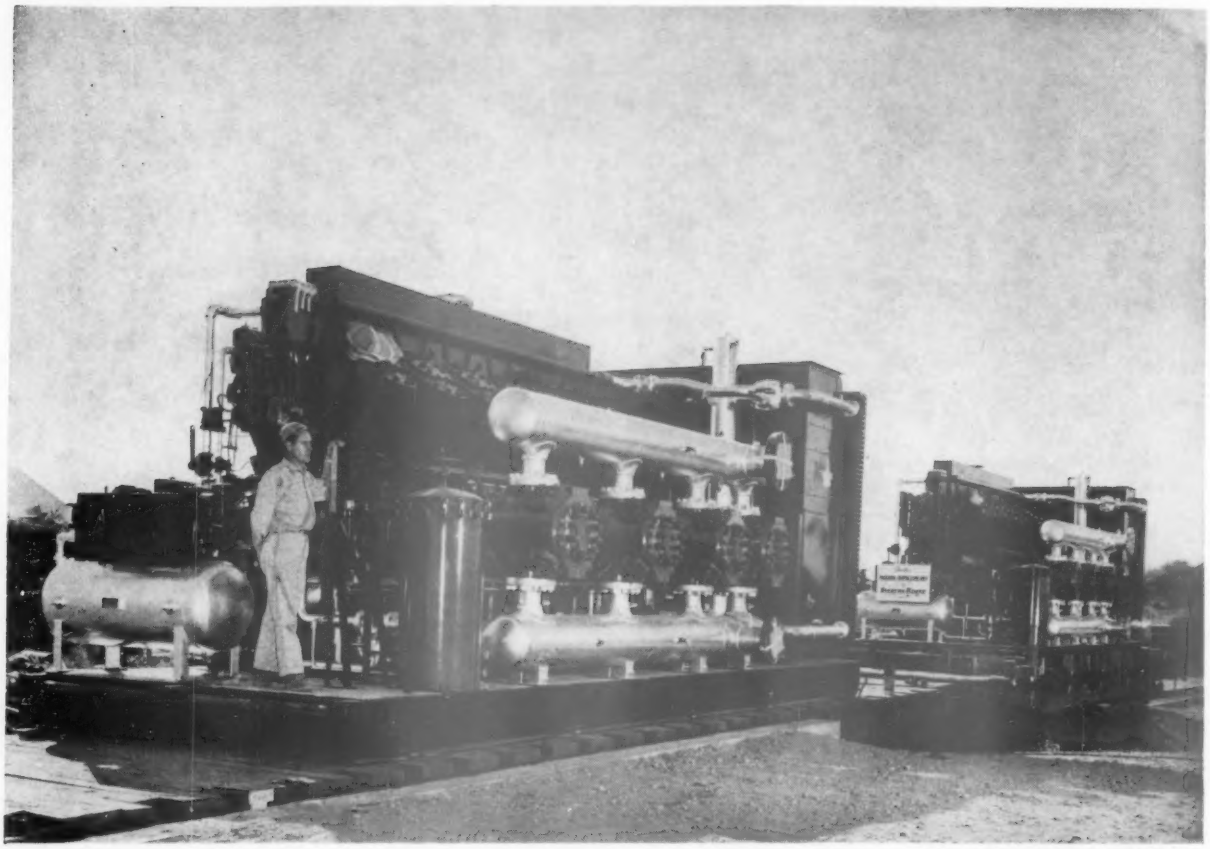

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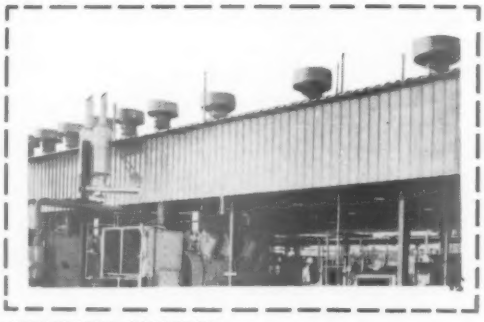

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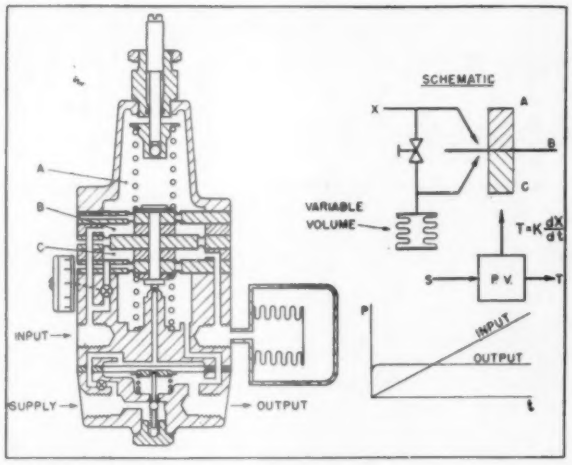
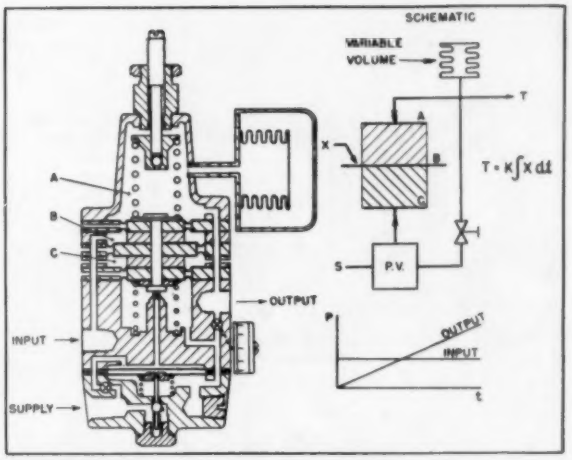


DIFFERENTIATION RELAY produces an output directly proportional to rate of change of input. Fig. 6.



INTEGRATION RELAY. Input loads chamber B, while output is accumulated in chamber A. Fig. 7.

provide this commonly required function are: (1) Pressure transmitters, (2) proportional controllers, and (3) adjustable-ratio relays.

Where scaling factors are fixed by the application as, for example, where flow signals are scaled to the same range, prior to addition or subtraction, the pressure transmitter appears to be the best choice from the standpoint of accuracy, reliability, and cost. When scaling factors are to be periodically modified, as, for example, when the factors represent revenue or cost figures which are subject to change, a good choice is an adjustable ratio relay.

An all-pneumatic ratio relay is shown in Fig. 5. The unit includes a scaling adjustment on the front panel and a duplex gage to indicate input and output. It uses a pressure-divider circuit, consisting of a fixed and a variable restriction. The input signal produces a flow through the two restrictions and into a 3-psi. reference pressure maintained by a datum regulator.

The intermediate pressure between the two restrictions is a function of their relative resistance. The pressure-divider provides only attenuation; however, if it is made to feed an amplifying relay, as shown, it is possible to adjust the gain above unity.

Differentiation. Fig. 6 shows a linearized pneumatic-differentiation relay which produces an output directly proportional to rate of change of the input. The relay is basically similar in construction to relay, Fig. 1, except that the annular effective diaphragm area in Chambers B and C is more than 10 times the effective area of the small diaphragms in Chambers A and B—giving a gain of greater than 10.

The input signal is transmitted unrestricted to Chamber B and passes to Chamber C through an adjustable restriction. When the input is steady, the forces resulting from pressures in B and C Chambers cancel each other, so that the output equals the zero-spring setting (usually midscale, 9 psi., if both positive and negative rates are to be measured). If the input pressure changes, a differential develops across the restriction. The relay transmits an output proportional to this differential.

For accurate results, this differential must be directly proportional to the rate-of-change of input. Using a needle valve which produces laminar flow provides a linearly proportional volumetric flow, but the differential developed across the needle valve is a function of the mass flow which varies with static pressure, because of compressibility. This compressibility error is approximately ±30%. The effect can be fully compensated, however, by the addition of a variable volume to Chamber C, the restricted chamber.

As the static pressure increases, tending to make the differential smaller because of higher mass flowrate, the volume increases proportionately to maintain a constant differential. The needle valve setting determines the rate time constant.

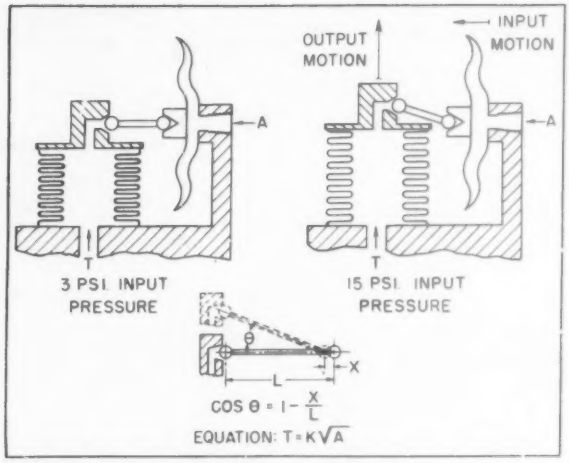
Integration. Integration, the reverse of differentiation, essentially involves measurement of accumulated pressure resulting from a flow which is proportional to the offset (from some chosen reference) of the input variable. Fig. 7 shows an integration relay. The input signal loads Chamber B. The output, it should be noted, is the accumulated pressure in Chamber A, not the booster-pilot output. The input signal determines the pressure differential across the needle valve.

As in the case of the differentiation relay, with laminar flow across the needle valve, the volumetric flow is directly related to the differential. The mass flow, however, which determines the accumulated pressure, still varies with the static pressure, because of compressibility. This effect is also compensated by connecting a variable volume to Chamber A. The needle valve sets the proportionality constant of the integrator.

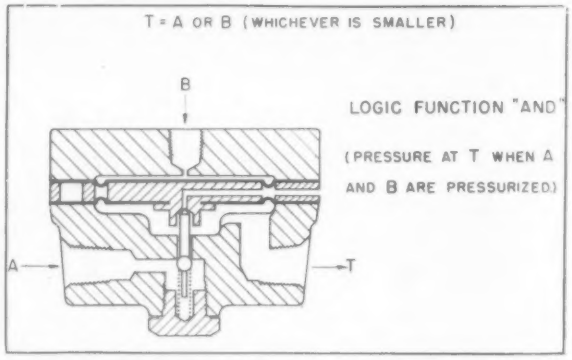
Square-root extraction. This function is regularly required to linearize signals from differential-type flowmeters, before carrying out further computations such as addition and subtraction. A number of devices, working on different principles, provide this function. In the Sorteberg Force Bridge, Fig. 4, square-root extraction results from connecting the output to Chamber A as well as Chamber C, giving the equation:

$$C^2 = B \times D$$

Two other designs of square-root extractors use an operating principle involving a geometric relationship, namely, change in cosine compared to the change in included angle, for



SQUARE-ROOT EXTRACTOR uses geometric relationship, where change in cosine is compared to change in included angle. Fig. 8.



LOW-PRESSURE SELECTOR places low-limit operating constraints on process variables. Fig. 10.

small angular displacements. Fig. 8 shows such a unit. Starting with the input and output at 3 psi., an increase in input causes the floating pilot link to restrict the pilot nozzle.

This increases the output pressure and moves the output feedback bellows upward, until balance is restored. Since the length of the floating link is fixed, the angular displacement produced by movement of the output bellows follows the relationship:

$$\text{cosine } \theta = 1 - \frac{x}{L}$$

A plot of the angle θ (output displacement) vs. x (input displacement in this equation shows the relationship to be virtually an exact square root.

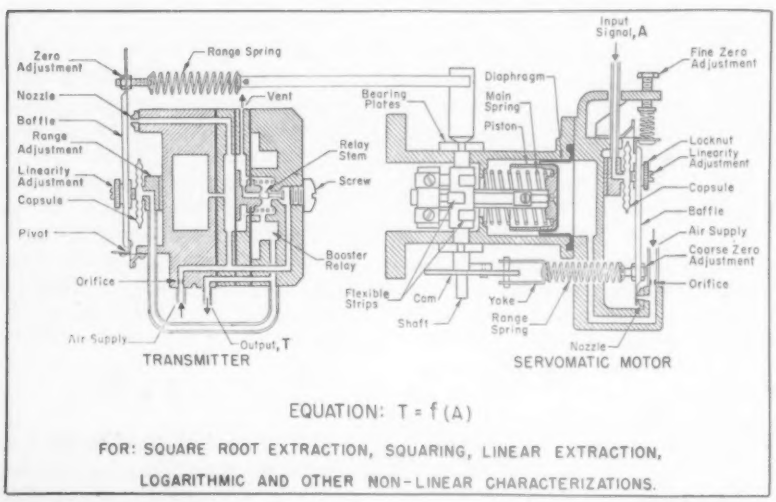
Square-root extraction is also provided by function generators—which are described next and are treated separately, as square-root extraction is only one of an almost unlimited number of functions for these devices.

Function generator. This unit generates variables which follow any linear or nonlinear relationship. Since most of them are cam-characterized, they can be made to generate any function which can be cut on a cam. Typical nonlinear functions accommodated would be square-root extracting, squaring, and logarithmic. This device is particularly useful because it is not necessary to know the variation of one quantity with another, analytically. Data supplied by a graph or a table is sufficient.

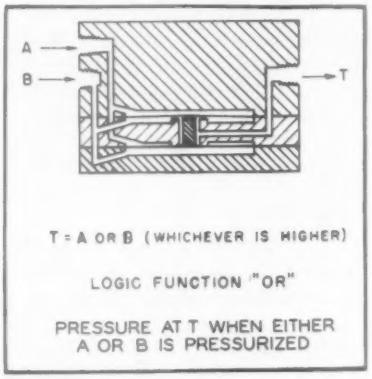
On the other hand, the function generator is also useful where the analytical function is known but impractical to produce by combinations of other computing components. The unit in Fig. 9 consists of a cam-characterized servomotor and a linear force-balance transmitter. A change in the input signal affects the nozzle backpressure, causing the piston to move and the cam shaft to rotate.

The piston moves until the cam rotates to a position where the resultant range-spring force balances the input force. The linear-force transmitter, coupled to the cam shaft, provides an output which is directly proportional to the angular rotation of the shaft. The input-output relationship, therefore, follows the cam-characteristic.

Function limiting. Oftentimes constraints must be placed on such variables as flow rate, temperature, and pressure. The low and high-pressure selector relays in Figs. 10 and 11 provide this operation when



FUNCTION GENERATOR consists of a cam-characterized servomotor and a linear force-balance transmitter. Fig. 9.



HIGH-PRESSURE SELECTOR places upper-limit operating constraints on process variables. Fig. 11.

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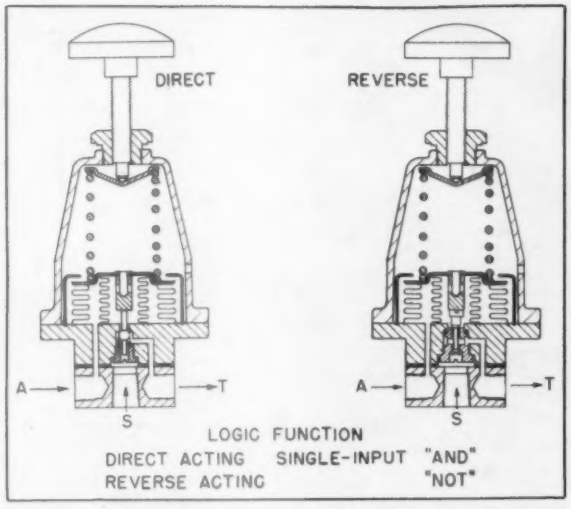
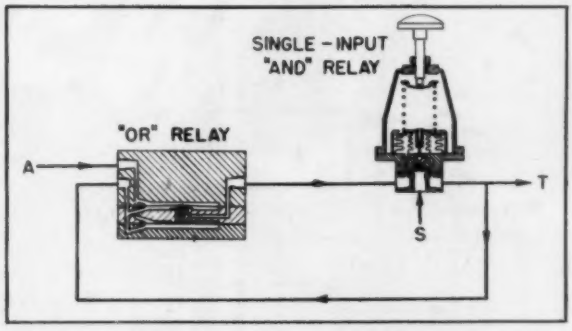


HIGH-GAIN CONTROL RELAY is used to provide NOT function. Signal is present if there is no input. Fig. 12.



MEMORY UNIT combines OR unit with single-input AND unit to provide memory function. Fig. 13.

a signal, representing the limit value, is connected to one of the two input connections. (These relays are also available with built-in limit-setting regulators, to allow adjustment of the limit value.

The low-pressure selector transmits either signal A or B, whichever is smaller. As a function limiter, it forms a high-limit relay. The high-pressure selector transmits the higher of two input signals through the action of its dual differential diaphragm. As a function limiter, it forms a low-limit relay.

Logic Functions

Logic functions are used primarily in digital systems, but they are often combined with analog devices.

AND unit. The low-pressure selector, Fig. 10 is a logic function AND unit. An output is transmitted only when input A **and** B are present.

OR unit. High-pressure selector, Fig. 11, forms an OR unit. An output appears if either signal A **or** B is present.

NOT unit. With the NOT function, a signal is present if there is no input; or, if there is an input, there will be no output. The reverse-acting high gain relay (on-off controller), Fig. 12, provides this operation. When the input signal, acting on the bellows, overcomes the spring-force, the pilot valve moves to close off supply and vent the output. With no input, the pilot valve permits supply to pass to the output. The same basic relay, with the opposite action pilot, forms a "single-input AND" unit.

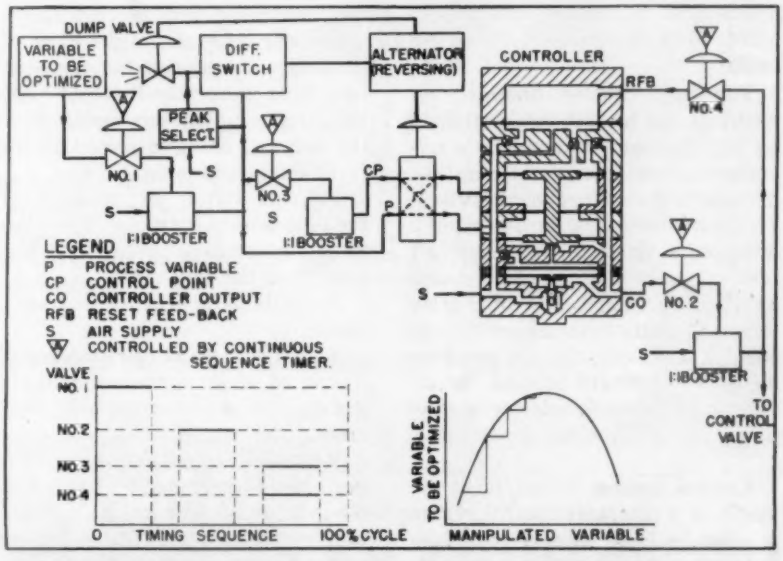
Memory unit. Fig. 13 shows an OR unit and a single-input AND" unit, combined to provide a memory function. With input A at zero, there is no output T. When an input signal appears, it is transmitted through the OR unit and actuates the single-input AND unit. Output T appears and holds in the single-input AND unit, through the action of the OR unit—even if the original input disappears.

Optimalizing Controllers

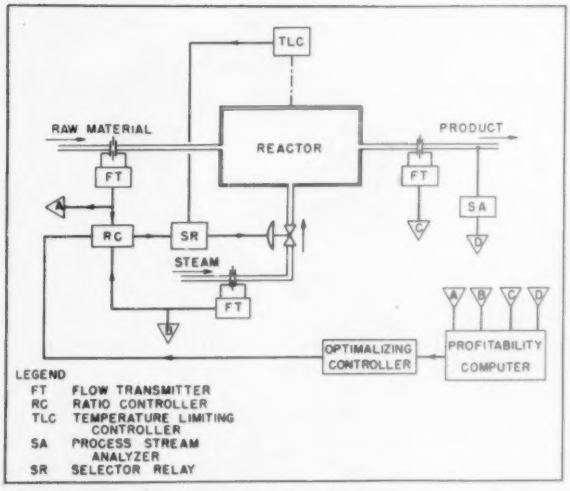
The components described thus far can be used to compute such factors as operating efficiency or profitability. But then, how can these quantities be optimized automatically—considering the fact that there is, frequently, a parabolic relationship between the manipulated variable and the quantity to be optimized—and that the curve (and optimal value) shifts with changes in operating conditions?

There are two basic methods: One is to construct a mathematical model of the process, so that the optimal value can be computed. This is the method used in the general-purpose digital computers.

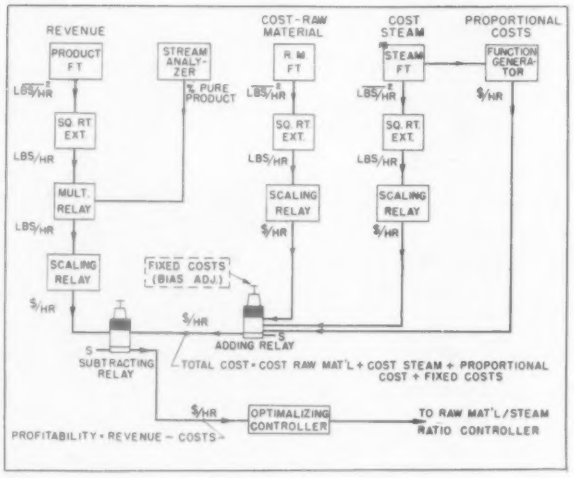
The second method is to use adaptive control, i.e., to optimize by automatic experimentation—cut and try. This can be done with either of two new optimalizing controllers, one of which is shown in Fig. 14. This optimalizer sweeps continuously, at a constant speed. As shown, it consists of a volume chamber and a booster relay—with a means for admitting air into the chamber to increase the pressure, or



CONTINUOUS-SWEEP OPTIMALIZER operates at constant speed to provide adaptive control by automatic experimentation. Fig. 14.



COMPUTER-CONTROL SYSTEM maintains proportion of steam flow to raw material flow in a petrochemical reactor. Fig. 15.



PROFITABILITY COMPUTER determines lb. per hr. of pure product and converts this signal to revenue rate. Cost rates for feed and steam are similarly determined. Fig. 16.

out of it to decrease pressure. Reversal controls open either solenoid SV-1 or SV-2 to control direction.

The setting of the needle valves on the flow controllers determines the sweep rate. In the diagram, flow controllers are indicated. These would provide a constant mass rate of flow in and out, hence, a linear change in pressure.

The reversal control circuit monitors the operation of the optimalizer and determines what direction the output should take. As long as the input (profitability, for example) keeps increasing, the output of the peak selector simply tracks the input, and the optimalizer continues to change the process in the same direction. Eventually, the process is driven past its optimal point (signaled by a decrease in the input value).

The peak selector, however, remembers the highest value attained by the input and holds this as a reference to one side of the sensitive differential amplifier and switch. Therefore, when the input drops, a differential develops, triggered off reversal as the position of SV-1 and SV-2 are alternated. The timer relay then isolates the reversal-control circuit for a period sufficient to allow the process to turn around. Simultaneously, the peak selector is reset to match new lowered input value.

Control system. A simplified example of a computer control system is given in Figs. 15 and 16. These show how the computing components just described can be applied to maximize profits in the operation of a chemical reactor. The system employs a computer to determine profitability of operation and an optimalizing controller to maintain profits automatically at an optimum.

In Fig. 15, raw material, steam, and product flows are metered. A ratio controller maintains the proportion of steam flow to raw material flow, according to a command signal from the optimalizing controller. A product-stream analyzer measures product purity. A constraint is placed upon the maximum temperature which can be allowed in the reactor.

Constraining action is supplied by an automatic temperature override control loop, consisting of temperature controller and selector relay[1]. These cut back the steam flow, if necessary, to prevent the temperature from exceeding the limit. Signals, representing the variables in the process, are transmitted to the profitability computer.

Fig. 16 shows the makeup of the profitability computer. The computer determines profitability according to the expression:

Profitability = revenue − costs.

where:

Total cost = cost of raw material + cost of steam + proportional operating costs + fixed operating costs.

Revenue rate, in terms of dollars per hour, is computed by linearizing the differential flow rate signal; then multiplying by a signal from the analyzer, to convert the signal to pounds per hour pure product. This signal, in turn, is modified by a scaling relay which converts the signal to represent revenue-rate. Signals representing cost-rate for raw material and steam are similarly determined.

Proportional operating costs are provided by a function generator, receiving its input from the steam-flow transmitter. These three variable costs become the inputs to a three-input totalizing relay. Fixed costs are added to this sum, simply by adjusting the bias in the relay. The output of the cost totalizer becomes subtrahend and the revenue-rate signal becomes the minuend in a subtracting relay which computes profitability-rate. The optimalizer maintains profitability at a maximum, regardless of changes in operating conditions.

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This article is adapted from a paper presented at the sixteenth annual symposium on Instrumentation and Control for the Process Industries, Texas A&M College.

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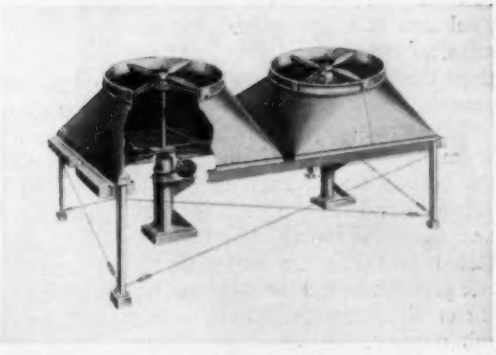

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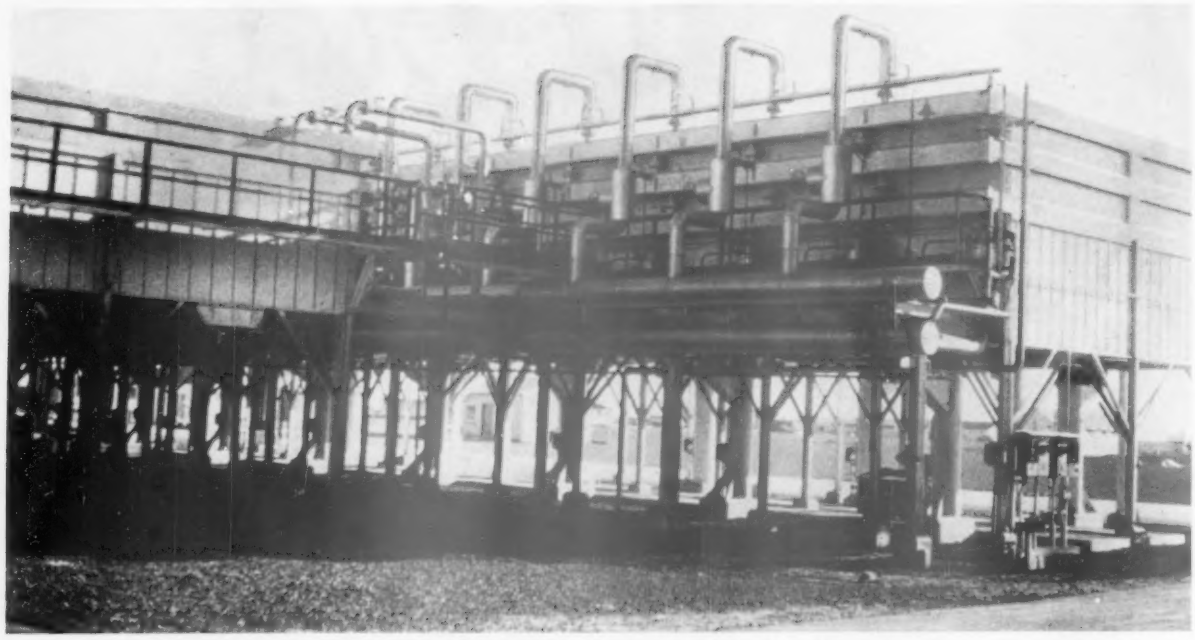

THINKING of installing air coolers? You will need to review these design details. Fig. 6.

The case for air-cooled exchangers

Here are the basics of their mechanical equipment

PART 2 OF TWO PARTS

BY J. R. CHRISTMAN
Design Engineer
Griscom-Russell Co.
Massillon, Ohio

AN AIR COOLER is made up of three basic parts. The first is the steel structure, the second the mechanical drive equipment, and the third the K-fin section or bare-tube section.

The structure of the air cooler normally represents about 15% of the over-all cost. Assuming that the section has been designed properly and the mechanical equipment selected properly, the unit will still not perform unless the structure can direct air across the bundle with a minimum of pressure loss. Therefore, whether the unit is induced or forced-draft, there are definite requirements such as design of fan rings, depth of plenum chambers, and factors pertaining to a change in direction of the flow pattern. These requirements have been predetermined, and it is not just by accident that a structure is designed one way rather than another.

Mechanical Equipment

The mechanical equipment can be broken into three major divisions: fan, transmission, and driver. The combination again normally represents about 15% of the total price. Air-cooling manufacturers have borrowed heavily on the experience of the cooling-tower industry. Much of the mechanical equipment, such as fans and gears, is of the same design.

Fans. There are many excellent fans on the market in a wide range of blade materials. Most common blade material is aluminum, followed closely by plastic. There are also carbon-steel, stainless-steel, and monel blades available. No air-cooled exchanger can perform satisfactorily if the fan can not be counted on to perform according to design conditions. However, there have been few air-cooler failures when the fans have been furnished by the three or four leading fan manufacturers.

Transmission. The term transmission refers to the means of transmitting power from the driver to the fan. The most common and trouble-free method is through a right-angle gear. Most cooling-tower gears are of the spiral-bevel design, although there are a great number of worm gears in operation. The advantage of the gear drive is the years of trouble-free operation with relatively low maintenance cost.

Driver. For smaller drives the use of V-belts has been growing steadily in popularity. Most refinery specifications allow the use of V-belt drives up to horsepowers of about 20 to 25. The V-belt drive is especially adaptable to suspension from the structure and is used almost exclusively for the overhead drive on many induced-draft units. The main advantage to V-belt drive is the initial cost. Provided the V-belt drives have been installed properly, they have a good operational record for the smaller drives.

The driver for most refinery installations is the electric motor. However, on quite a few installa-

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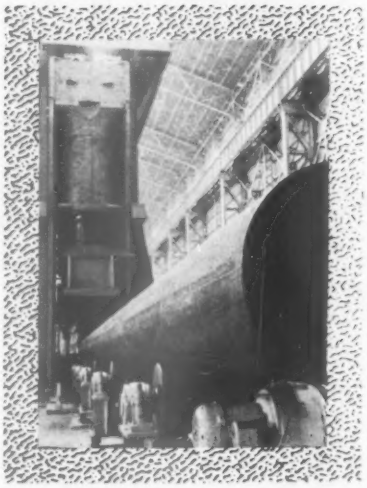

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tions, steam-turbine standbys have been provided in case of power failure. Examples of almost every type of driver, including hydraulic motors and gasoline engines, have been used and proved successful.

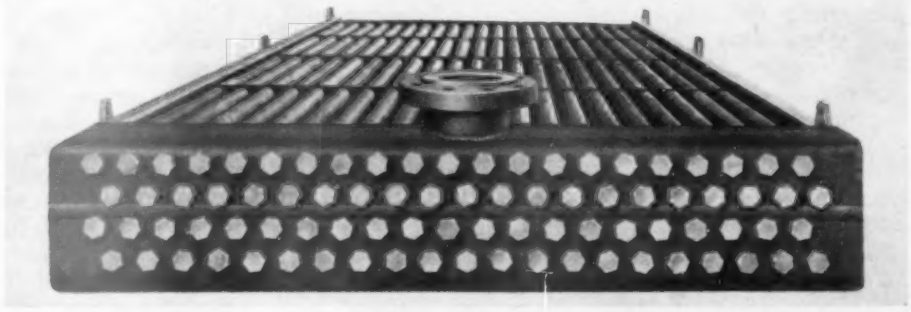
K-Fin Section

The heart of the air cooler is the K-fin section. This portion represents approximately 70% of the cost on the average installation. The sections, in turn, are made up of front and rear headers, side channels, including air stops and tube supports, and the tubing. Although there are numerous exceptions, most refinery air coolers are carbon-steel tubes with aluminum fins. Steel tubes are not only more economical but also afford excellent protection in case of flash fires. Stainless steels, chrome moly, and monel are also used for special duties, as well as admiralty for some water coolers. For the purpose of the following discussion, we have assumed the most common materials, that is, carbon-steel tubing with aluminum fins.

Fin tubing. A great deal has been written on the advantages and claims of various fin-tubing manufacturers. It is difficult to be purely objective, as many of the advantages claimed for the types have not proved correct in practice.

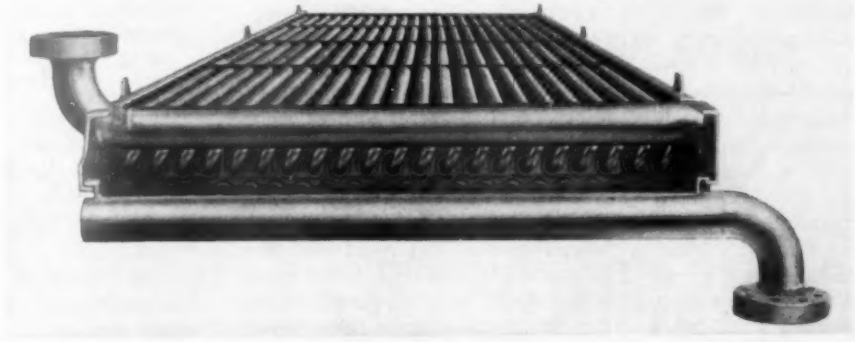
The simplest and least expensive type of extended surface is the tension-wound finned tube. In this process, the fin is wrapped helically around the tube under tension. Although there are numerous designs and manufacturers, the majority of these tubes rely on either a soldered or mechanical lock at each end to insure tightness of the fin.

In most tension-wound fins, it is



WELDED BOX HEADER is most commonly used. It has been designed for pressures ranging from 25 to 4,000 psi. Fig. 7.

COVER PLATE HEADER differs from the welded box type in that the tube plugs and plug sheet are replaced with a flanged cover plate. Fig. 8.



MANIFOLD HEADER is used for high-pressure processes. It has been designed for units with pressures up to 10,000 psi. Fig. 9.

essential that the fin maintain its tension throughout the full length of the tube and that the ends be securely locked. Some of the more recent manufacturing processes do allow some relaxing of the fins without destroying the fin-to-tube contact throughout the whole length of the tube.

While this type of fin tubing does not have wide acceptance with most refinery engineers and operators, the fact remains that it has the longest history of successful operation. The tension-wound fin was developed to cool low-temperature fluids, such as jacket water and tube oil. Its operational record has been excellent. Most refinery engineers use the tension-wound fin tube but limit its use to moderate - temperature applications.

The second type of fin is a modification of the tension-wound finned tube. While the fin is, in effect, a tension-wound fin, before it actually is applied to the tube it is formed into either an L or J, depending upon the type of finning lathe. Once again, there are a variety of processes all performing the same general result.

This type of finned tube offers some advantages over the straight tension-wound fin.

First, with the L-shaped foot at the base of the fin, the fin has a much greater contact area. This dissipates more heat, thus enabling the tube to operate at a higher temperature level.

Second, the foot definitely spaces and holds the fins in place preventing longitudinal movement.

Third, although it has never been established that a finned tube has failed from air-side corrosion, the fact remains that some people prefer a tube which has an aluminum shield around the tubing. The L-footed fin offers this protection.

Since the footed fin tube is tension-wound and the fin-to-tube contact is purely a tension bond, it is definitely limited in regard to maximum metal temperature. And, since it relies purely on a tension contact, a definite bond resistance exists and must be computed for every selection. This type of tube must therefore be limited to medium-temperature ranges to insure a good tube-to-fin bond. The footed fin is also subject to longitudinal growth.

The third type of fin tube is the bimetallic or extruded fin. In the manufacture of the extruded fin, a heavy-wall aluminum tube is placed over the pressure tube. In the finning operation the aluminum fins are extruded from the outer tube while at the same time forming the bond between the exchanger tube and the finned aluminum "muff" tube. Also included in this general category is the bimetal tube. A steel tube with a thin aluminum outer tube is grooved and finned.

The service record of this tubing is excellent. It offers the advantage of protection of the steel tube over the major portion of the length. However, as in the case of the tension-wound and L-footed fin tubes, because the bond is formed in effect by drawing the outer tube over the inner tube, this type of tubing is subject to increasing bond resistance as the temperature of the exchanger increases.

There has been a great deal of experimental work done on the effect of high temperature on this tubing. Young and Katz have reported on cycling effect of a bimetal tube[1], and Gardner and Carnavos have outlined the contact resistance of this type of tubing in comparison with both the tension-wound and grooved fin tubes.[2]

Young and Katz found that in addition to a thermal expansion of the muff away from the liner, there is a longitudinal growth of the muff. This means that it is essential that the aluminum muff have several inches in which to grow in length.

A fourth type of finned tubing holds the fins in place by soldering or brazing the aluminum fin to the bare tube. There have been several processes attempted but with varying degrees of success. It is extremely difficult to maintain an acceptable bond between aluminum and another type of metal. The result has been that the fin-to-tube joint has had very low physical strength.

The fifth type of tubing is the grooved tubing. With this tubing the fin is imbedded in the tube wall. A helical groove is plowed into the tube wall. In this process no metal is removed, only displaced. After the fin is wound into this groove, the upset metal is rolled back on each side of the fin base to hold the fin in place.

Without a doubt, this type of tubing has the best thermal contact of all tubing used for air coolers. The maximum temperature depends only on the maximum temperature of the tubing. Experiments have proved that although fully annealed, the fin-to-tube bond was intact at metal temperatures within 50° F. of the melting point of the aluminum fin. Further experimentation has also proved that the tube withstands a higher pressure after it has been grooved than on the ungrooved portion.

There are millions of feet of grooved fin tubing in the field, and, to our knowledge, there has not been a single failure due either to thermal difficulties or atmospheric corrosion.

Samples of grooved steel tubing with aluminum fins have been placed in the 80-ft. and 800-ft. lots at International Nickel's Kure Beach lab in North Carolina. The tubing in the 80-ft. lot is sprayed with salt spray periodically. Results showed that it took approximately 1 year of exposure before sufficient corrosion took place to enable the fin to be physically **pulled** from the tube. It must be remembered that during this test there was no tube-side fluid heating the tubing, thus keeping the tube dry. In normal operation the hot tube-side fluid and warm air keep the outside of the tubing dry, preventing air-side corrosion.

For shipment, the tubing is sprayed with rust preventative to insure that no corrosion can take place before the unit goes into operation. Grooved steel tubing will thus give many, many years of trouble-free operation.

There are several types of finned tubing — square fins, plate fins, welded fins, but in general, most air coolers are manufactured with the types of tubing outlined here.

Headers

There are three basic types of headers. The first is the box type which uses a shoulder plug opposite each tube end, this permits access to each tube hole for cleaning and rolling.

This type of header is the most commonly used and has been designed in pressures from 25 to 4,000 psi. Since the header is a box (constructed of either two U - shapes welded together or four plates), the

pressure is carried on four sides. Most headers are ¾ to 1 in. in thickness, although thicknesses up to 1½ in. are not uncommon.

With the use of shoulder plugs, the seal is maintained by a soft metal gasket located under the plug shoulder. Most units in operation are of this construction. It is regarded by many as the only type of header capable of holding hydrogen.

The second type of header construction is the cover-plate header. This type of header replaces the tube plugs and plug sheet with a flanged cover plate. In this case, the full design pressure is carried on three sides of the header with a corresponding increase in header thickness.

Experience has shown that the cover-plate header is more susceptible to leakage. There is a tendency for the stud bolts to relax, thus allowing small corner leaks. Also, difficulty is sometimes experienced in holding uniform gasket pressure over the long header width. However, for heavy-oil and crude units, cover-plate headers are essential with the obvious advantage of access to the complete header.

The cover-plate header increases cost of the fin section by approximately 8-10% for design pressures of 150 to 200 psi. In the higher pressure ranges the increase in cost rises rapidly.

There have been several designs which use a bonnet-type cover, thus reducing the cost somewhat. However, the disadvantage is that the cover must be removed to disconnect the piping. This has offset the lower installation costs in most cases.

The third type of header is the manifold design. This header is used for extremely high-pressure processes found in the petrochemical field and for special experimental processes. The manifold header is an all-welded design and has been used for air-cooled units with pressures to 10,000 psi.

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2. Gardner, A., and Carnavos, T. C., "Thermal Contact Resistance in Finned Tubing." Presented at 1959 annual meeting of ASME.

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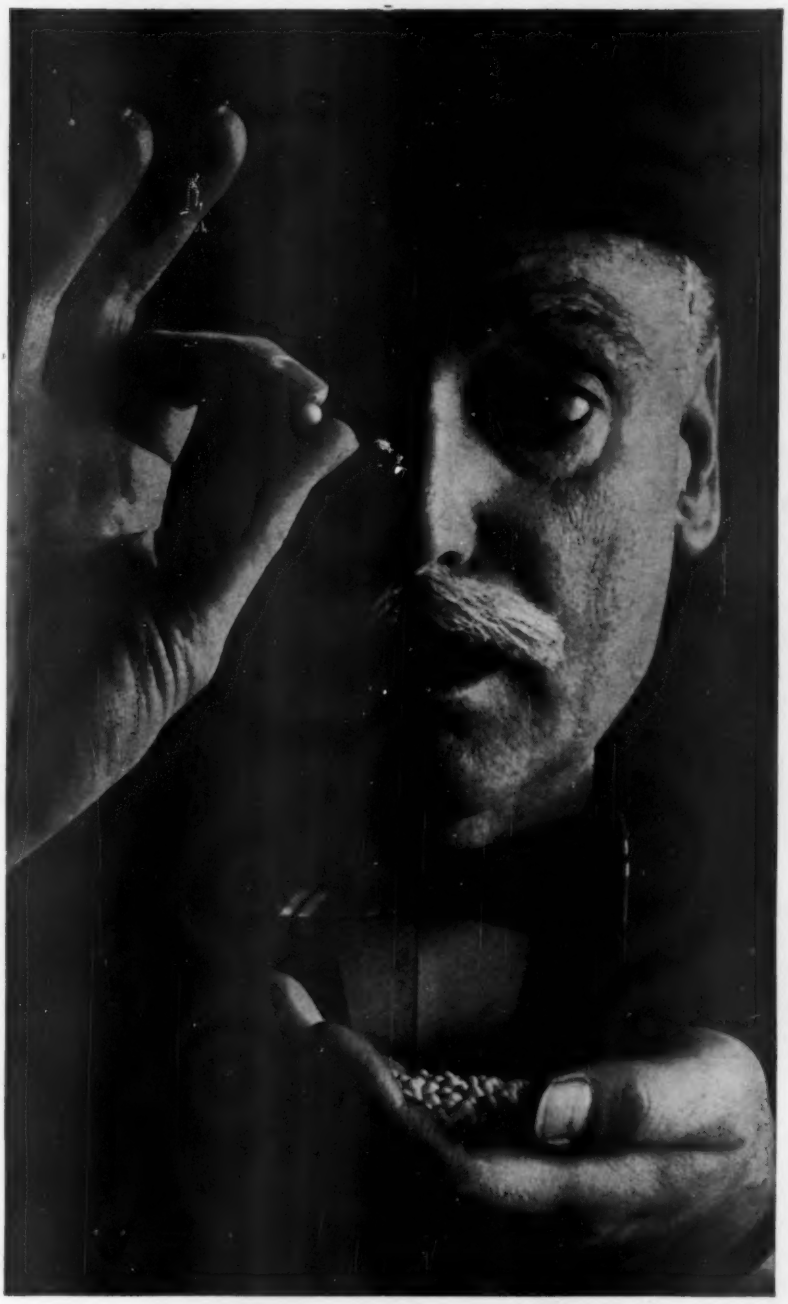

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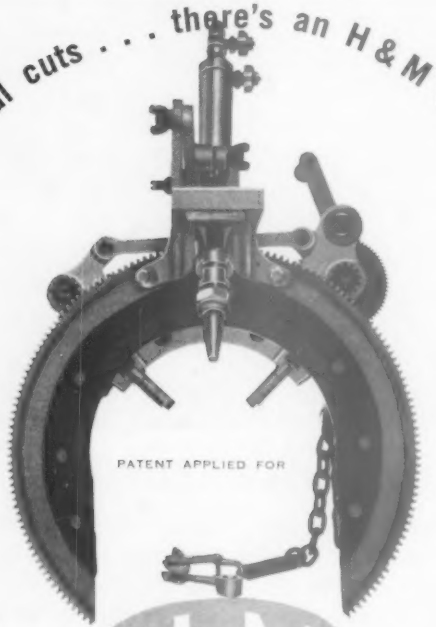

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Thomas, John W., "Economics of Air Cooling in Refinery Installations Where Water Is Plentiful." Presented at 1958 annual meeting of AIChE.

Nakayama, E. U., "Find the Best Air Fin Cooler Design." Presented at 1958 annual meeting of AIChE.

BOOKS

ANTITRUST LAWS, ET AL. VS. UNIT OPERATION OF OIL OR GAS POOLS. By Robert E. Hardwicke. Published by Society of Petroleum Engineers of AIME, 6300 North Central Expressway, Dallas 6. 352 pp. $8.

The original volume, on legal problems relating to unit operations and other conservation measures, has been revised by the addition of a supplement, concisely describing important developments in the field since the book was originally published in 1948.

As the mechanical principles governing the movement of oil and gas in a reservoir have become more clearly understood, it is increasingly apparent that unit operation is often necessary to prevent waste, increase ultimate recovery, and protect correlative rights of producers and royalty owners.

A detailed history of the conservation movement to date is included, with emphasis on the impact of antitrust and other law on the movement.

PRESTRESSED CONCRETE CYLINDRICAL TANKS. By L. R. Creasy. Published by John Wiley & Sons, Inc., 440 Park Avenue South, New York 16. 218 pp. $6.75.

Prestressed concrete cylindrical tanks are now used extensively for the storage of water and other liquids used in industrial processes.

These structures are cheaper than other forms in first cost, carry lower maintenance charges and employ less materials.

The design of these structures can be somewhat complex. A number of decisions must be made during the initial planning which affect the over-all cost of the project. The basic mathematical expressions required for the design are troublesome to develop and detailed calculations can be lengthy.

This book makes a special feature of methods which reduce the time required for preparing calculations in the design office.

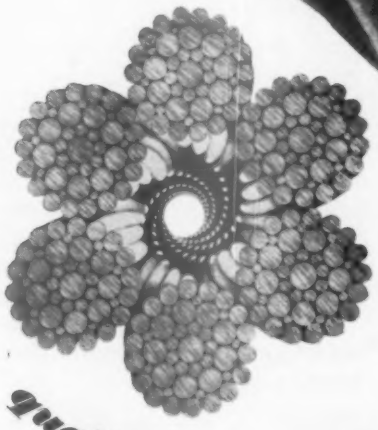
Fully monolithic cylindrical tanks with rigid joints are sometimes necessary for special functions, where absolute liquid-tightness is particularly important. Simplified expressions are developed for the design of this complex form.

A chapter is devoted to the essential features of the construction procedure required to insure liquid tightness. Detailed instructions are given for making simple yet effective repairs by pressure grouting to seal leaks in the concrete structure should these develop.

The cylindrical structure lends itself to a dome roof cover. Simplified expressions are given for their design together with rapid correction factors to allow for the partial fixity at the junction of the dome with the supporting walls.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

We put a lot of work into it — You get a lot of work out of it



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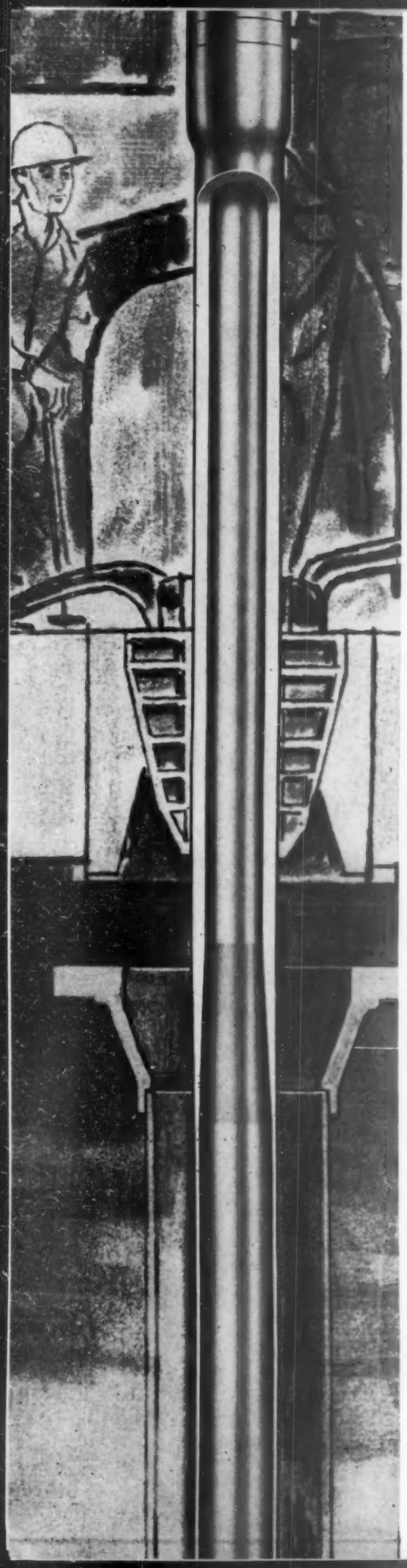

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DUAL WEIGHT DRILL PIPE

SUCCESS IN FIELD TEST

In West Texas, South Louisiana, Oklahoma and out on the West Coast, Pittsburgh Steel Company's new Dual Weight Drill Pipe is proving itself the way drillers best understand—by performance under actual field conditions.

Dual Weight is a completely new type of drill pipe developed and produced exclusively by the manufacturer of "Pittsburgh Seamless."

It provides drillers an integral combination of strength and light weight never before available in popular API grades and sizes of drill pipe.

Drilled footage on four strings of Dual Weight now stands at better than 100,000 feet—every inch of it under normal rotary drilling practices.

Results? Excellent—better than expected in some cases.

Field tests are continuing. Additional strings are being placed in service on drilling operations specifically selected to prove out Dual Weight's advantages and performance under the widest possible range of drilling conditions.

But, so far, here's what experience shows Dual Weight does:

- Cuts drill string weight.
- Increases rig depth capacity.
- Increases slip area strength up to 20 percent.
- Boosts hydraulic performance.
- Effects lower maintenance costs and longer service life on rig equipment.
- Cuts transportation costs.
- Increases drilling rates and speeds up round-trips.

• **What is Dual Weight?**—First of all, it's one of the most important developments in rotary drilling in many years. It's an entirely different type of drill pipe design—although it looks the same as other drill pipe. The difference is in the ID.

Look at the cutaway sketch at the left of this page. It shows Dual Weight's design features.

Notice the box end. Below the tool joint and upset, it has at least four feet (but not more than six feet) of heavy wall steel in the critical slip area. Then, a gradual, uniform internal taper makes transition to a light wall body that extends the remainder of the joint's length.

Some drillers refer to the heavy wall at the box end as a "long upset"—a good description, but inaccurate. The heavy wall is produced

by a patented process that bears no resemblance to upsetting.

Drillers can benefit two ways with Dual Weight.

If it's a lower hook load they want, then thin wall Dual Weight meets the need. It combines the strength of standard pipe in the slip area, and the weight saving of lighter weight pipe in the body.

Or, if extra strength and safety—rather than lower weight—are required, Dual Weight again is the answer. In this version, it has a standard wall body and an extra heavy box end with a safety factor

near or equal to the safety of the body.

• **Strength?**—Either way, Dual Weight has it—in the slip area where it's needed to resist the notching, crushing, crimping, stretching and bending forces it is subjected to.

Light weight? Its thinner wall body eliminates pounds per foot over 85 percent of the length of a 30-foot joint.

For example, 4½-inch Dual Weight with a .337/.254-inch wall weighs 16.60 lb./ft. for 15 percent of its length (the box end) and 13.25 lb./ft. for 85 percent of its length (the body).

And don't overlook hydraulic performance. The larger ID resulting from Dual Weight's thinner body wall lets pumps push more mud at lower pressures. There's more energy applied at the bit. Penetration rates are higher and returns are better.

But here's a sample of how drillers themselves benefit from Dual Weight.

A Large Independent Oil & Gas Drilling Corporation—drilling shallow wells in West Texas with 6,000 feet of 4-inch (.330/.254-inch wall) Grade E Dual Weight.

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A Veteran Tool Pusher—"We save trip time because we can come out of the hole faster. With less weight we get more rpm's. We save fuel, too, because our engine isn't working as hard."

• A major oil company, drilling deep wells in Louisiana with 15,000 feet of 4½-inch, (.337/.271-inch wall) Grade E and P-95 Dual Weight.

A company drilling engineer said: "We're looking for higher velocities and larger volumes of fluid at equal pump pressures from Dual Weight. We know we're getting better hydraulics—moving more fluid.

"In deep drilling with high mud weights, you get better penetration with increased bit hydraulic horsepower. We calculate we're getting a 25 percent increase in BHP."

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Steel

New CL-CLS mud proves its mettle

—in high-temperature, high-pressure wells

Simplicity and versatility are the virtues claimed for this new chrome lignite-chrome lignosulfonate mud. It resists high temperature, stabilizes downhole formations, and controls fluid loss. Result usually is less hole trouble, faster drilling. More than 300 field tests testify to the new mud's effectiveness. The authors also give 12 good rules for field control of any mud system.

BY FRED CHISHOLM, ROBERT W. RUHE, JR., AND WILLIAM J. MURCHISON
Magnet Cove Barium Corp., Houston

MORE THAN 300 wells in the past 9 months have been drilled with a new chrome lignite-chrome lignosulfonate (CL-CLS) mud. Results from these wells shows that the new mud is simple, temperature stable, resistant to contamination, and money saving.

The CL-CLS mud has these advantages:

1. There is no viscosity hump or breakover during preparation to interfere with drilling.
2. Only a few materials are used. No calcium salts, such as lime or gypsum, are needed to furnish inhibition. The pH of the mud is low so it is easier and safer to work with.
3. None of the common fluid-loss-control agents are needed or used.
4. There is no complexity of chemicals to maintain. You simply treat with bentonite, caustic, chrome lignite, and chrome lignosulfonate. Solids are controlled with water.
5. Viscosity is lower since there is no thickening from fluid-loss-control agents. The lower viscosity means more hydraulic horsepower at the bit for less money.
6. Mud costs and over-all drilling costs are usually cut because the mud stabilizes the well bore and promotes faster drilling.

Presented at 1961 annual meeting of American Association of Oilwell Drilling Contractors, Houston, under title, "Good Mud Practices Are Not by Accident."

LOWER OVER-ALL DRILLING COSTS resulted when this 9,500-ft. well in the Nederland area of Jefferson County, Texas, was drilled with a 17-lb.-per-gal. CL-CLS mud. CL-CLS mud is marketed under trade name "XP20-Spersene" by Magnet Cove Barium Corp.

In order fully to appreciate the advantages of the new system, we must understand the failings of the mud which preceded it. For instance, at the beginning of mud technology, the early muds had too high a filtration rate. As a result, shales swelled and sloughed into the holes. Thick filter cake was frequently the cause of stuck pipe. Fishing jobs and abandoned holes were common.

Muds of modern day. High temperature and pressure were the undoing of the low pH phosphate and caustic - quebracho muds that were popular in the 1940's. These muds couldn't resist contamination, they were chemically unstable, and their mud-making tendencies took a lot of water for dilution and a lot of barite to get back the weight. The shortcoming of these muds was only partially corrected by lime muds.

Shortly after World War II, lime muds were the thing. They worked fairly well when contaminated from formation solids and salt - water flows. Lime muds had good drilling characteristics, were easy to maintain, and were big improvements over low pH muds, but they solidified at high temperature, often prevented logging, and hindered completion operations. Solidification also caused costly washover opera-

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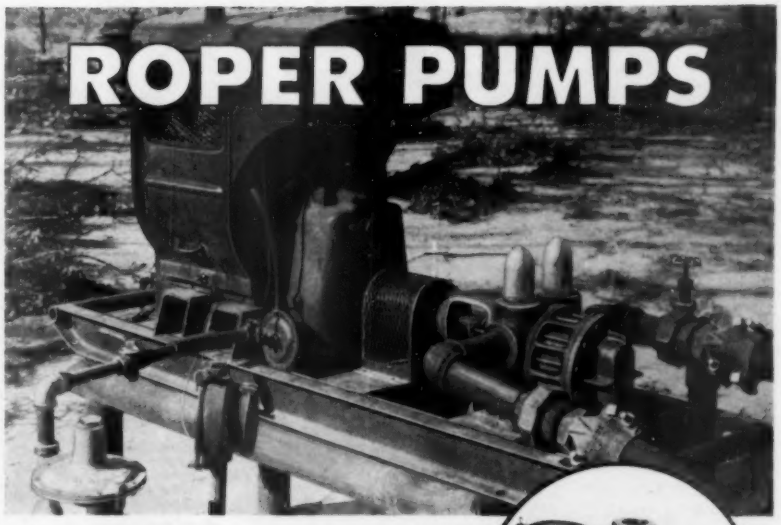

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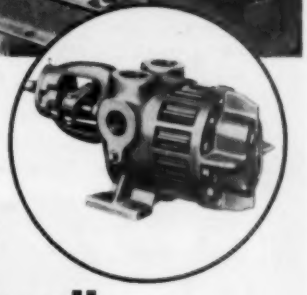

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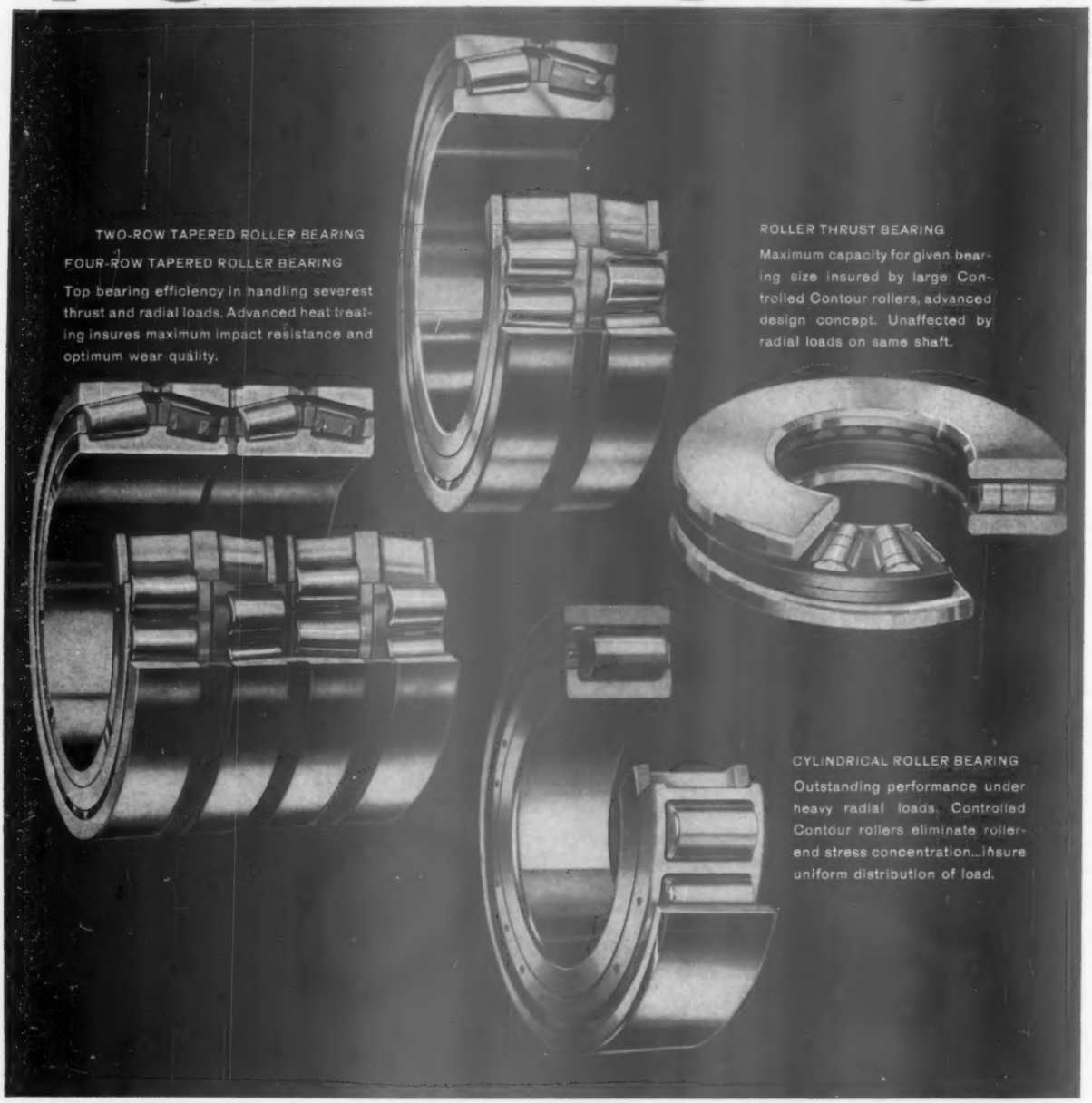

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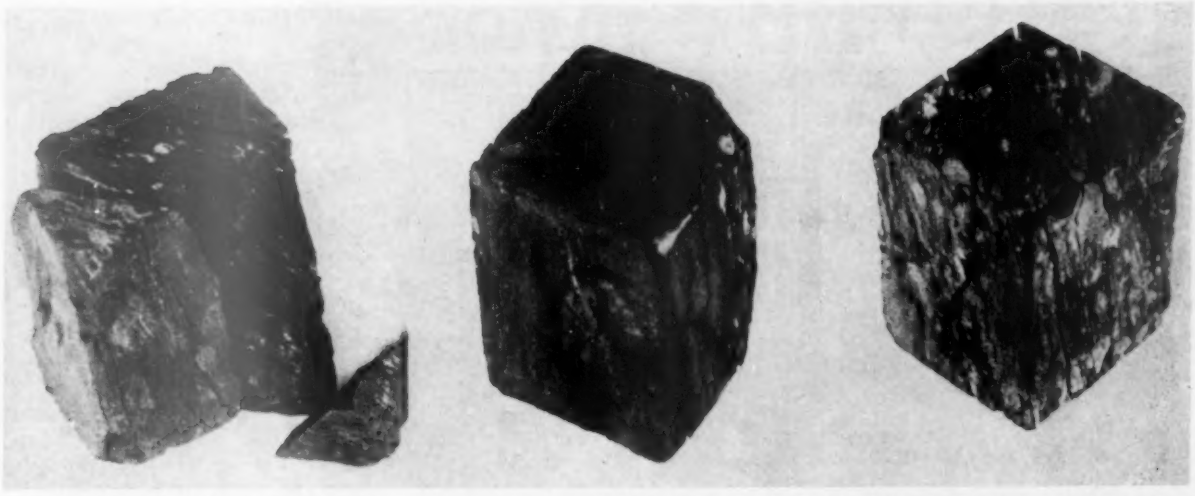

NINETEEN DAYS OF IMMERSION had these effects on cubes of Atoka shale. Cube in distilled water (left) virtually disintegrated. Cube from gyp-mud filtrate (right) was in better condition but not nearly so well preserved as the one from the CL-CLS mud filtrate (center). CL-CLS mud is marketed under trade name "XP20-Spersene" by Magnet Cove Barium Corp. Fig. 1.

tions during workover, so lime muds were no good as packer fluids either. The tendency to solidify at high temperatures has made them impractical in many areas.

Later, lime muds were changed by lowering lime content and alkalinity. This helped temperature stability, but no much.

Shale-control muds, surfactant muds, and gyp muds have come along in the last 10 years. Like everything that went before, they were steps toward solving the old problems of high-temperature stability and well-bore stabilization. These muds usually have relatively high-filtrate calcium and have been referred to as inhibitive muds. They have all been useful, but in many cases have failed to get the job done. Either they have lacked temperature stability or have had filtration characteristics at high temperature and pressure, which has lead to hole troubles and added cost. In short, they do not meet all the requirements of today's deep drilling.

New CL-CLS mud. In the past year, the new chrome lignite-chrome lignosulfonate mud has been developed. It solves the problems that the older muds did not. This new mud has the singular advantage possessed by the very earliest muds: **it is simple to prepare and maintain.**

It basic ingredients are water, bentonite, barite, caustic soda, chrome lignite, and chrome lignosulfonate.

In spite of its simplicity, this mud is usually stable under high temperatures and high pressures. It has outstanding filtration characteristics, it retards the natural swelling of drilled solids, and it has excellent tolerance for contaminants.

The successful performance of this mud is due to the synergistic effect of the chrome complexed compounds of lignite and lignosulfonate. These two chrome compounds have a protective action upon the mud solids which controls viscosity and filtration. It resists contamination, even under extreme conditions.

Not only is it very simple to prepare and maintain the chrome lignite-chrome lignosulfonate system, but also the mud can be converted at any depth. There is no viscosity hump and no dangerous filtration increase at breakover as there oftentimes is with calcium inhibited muds. Most important of all, the new mud is relatively low in cost and helps cut over-all drilling costs.

Case Histories

The effectiveness of the CL-CLS mud can best be shown by typical field case histories. These wells are some of more than 300 which have used the chrome lignite-chrome lignosulfonate system during the past 9 months. They demonstrate the simplicity, temperature stability, resistance to contamination, and money saving of this mud.

Cameron County, Texas. A well in Cameron County in South Texas shows the simplicity of the new system. To total depth (15,659 ft.) mud-flow properties and water loss remained good.

Below 11,000 ft., additions of caustic soda, chrome lignite, and chrome lignosulfonate remained relatively constant. For example, in 13 days of drilling over a 2,000-ft. interval, tourly treatment remained about the same—200 lb. of caustic, 150 lb. of chrome lignite, and 300 lb. of chrome lignosulfonate. The result was mud properties almost identical throughout the entire period.

The only mud materials used to total depth were barite, bentonite, caustic soda, chrome lignite, chrome lignosulfonate, and a few sacks of soda ash and bicarb.

Cost of the mud for drilling this well was $64,767.59, or about $4.13 per foot. A maximum mud weight of 16.2 lb. per gal. was reached at 13,900 ft. and remained constant to total depth. Bottom-hole temperature below 15,000 ft. was well above 300° F. The temperature had no bad effect on the mud system. As a result, the mud remained stable and maintenance costs were low.

Laboratory tests indicated the mud would have remained stable at temperatures considerably above 400° F.

Total depth was reached in 1,200 rotating hours with no problems such as sloughing shale or stuck pipe. No time was needed to condition the mud as it remained stable throughout the entire operation. In 80 drilling days, 47 bits were used. A 12¼-in. hole was drilled to 9⅝-

Table 1—Fluid-loss properties for 18.3-lb. per gal. mud

Depth	API	Fluid loss cc. 100 psi.-300° F.*	Temperature limit† 500 psi.,-300° F.*	
14,365	1.8	12.8	7.2	498° F.
14,718	1.5	14.0	7.2	500° F.
15,000	1 8	10.2	10.0	532° F.

*Corrected to area of API test. †Measured on modified cement consistometer.

Table 2—Mud costs for two offshore wells

Total depth	12,818 ft.	12,949 ft.
Mud type	CL-CLS	Gyp
Mud weight	17.5 lb./gal.	16.9 lb./gal.
Mud cost	$40,921.55	$83,810.48

Table 3—Mud costs for CL-CLS and gyp systems

Total depth	10,990 ft.	11,000 ft.	10,925 ft.
Mud type	CL-CLS	Gyp	Gyp
Mud weight	16.0 lb./gal.	16.0 lb./gal.	16.0 lb./gal.
Mud cost	$19,235.00	$45,288.00	$32,088.00
Bits	23	* 23	* 20
Rotating hours	462	487	480
Drilling days	33	34	37

*Includes one diamond drilling bit.

Table 4—Mud costs for CL-CLS and gyp muds for Vermilion Parish wells

Total depth	11,500 ft.	11,578 ft.
Mud type	CL-CLS	Gyp
Mud weight	13.1 lb./gal.	13.5 lb./gal.
Mud cost	$16,092.84	$25,509.23
Bits	12	17
Rotating hours	204½	208¾
Drilling days	13	19

in. casing point at 11,000 ft.; 8½-in. hole was drilled to TD.

Here is a very important point: the last 4,500 ft. of hole drilled at about the same rate (7.4 ft. per hour) as did the interval between 8,000 and 11,000 ft. (8.7 ft. an hour).

The well-logging engineer stated that the CL-CLS mud was an excellent fluid for electric logging. Furthermore, there was no excess buildup of wall cake, and generally, the entire hole was near gage.

The most recent deep well in the same general area was drilled about the same time with a gyp to a depth of 16,100 ft. Drilling time was 115 days, at a mud cost of $122,873.94. The operator for the example well had allocated over $100,000 for mud.

Zapata County, Texas. The CL-CLS mud has always looked good at very high temperatures in the laboratory. An opportunity to verify this in the field was in a well in Zapata County. The hole is one of the deepest ever drilled in the area. The operator estimates bottom-hole temperature was slightly over 400° F. although the electric log showed only 379° F.

From the outset the well was plagued with crooked hole, a common problem in the area. The crooked hole accounts for much of the time, both in drilling days and rotating hours, required to complete drilling.

Good filtration control was maintained to total depth. Laboratory tests showed an excellent high pressure-high temperature filter loss and a compressible filter cake. The result undoubtedly was better hole conditions. The filtration control is proof of the chemical stability of the mud system. There were no problems with viscosity or gel strengths during the drilling.

At total depth of 15,000 ft., mud weight was 18.3 lb. per gal. Total mud cost was $96,789.52. In 130 drilling days, 48 rock bits, 1 diamond drill bit, and 1 diamond core bit were used. Table 1 shows fluid-loss properties.

Offshore Louisiana. There is a good example of stability or resistance to contamination in a well drilled offshore from South Louisiana. Other wells in the area drilled to projected total depth in about 28 drilling days. This operator used the new chrome lignite-chrome lignosulfonate mud and reached the same depth (12,818 ft.) in only 17 drilling days. This fast time is remarkable due to the fact that the well had a gas kick and two salt-water flows. Mud cost was less than half that on the offset well using a gyp mud. Table 2 shows this.

Despite abnormal problems, the hole stayed in good condition at all times. At one time, mud weight was raised from 13.8 to 17.5 lb. per gal. while the well was shut in with as much as 3,000 psi. on the preventers. Still, the drill pipe did not become stuck or try to stick at any time during the gas and salt-water flows. The flows were readily killed and operations resumed quickly.

The contractor was enthusiastic over the easy maintenance, fast drilling, and excellent hole conditions in this well. In fact, he asked that the same kind of mud be used on the next well he drilled nearby for another operator.

DeWitt County, Texas. Table 3 compares mud cost of a CL-CLS system to two gyp muds drilled in DeWitt County, Texas. The comparison is made to about 11,000 ft., although the CL-CLS well was drilled to 13,700 ft.

The CL-CLS well was cheaper in over-all drilling cost as well as in mud cost. The over-all savings was still there even though a diamond bit was used to drill about 600 ft. of both comparison wells, thereby cutting off about 1 day of drilling time and 20 hours of rotating time from those wells.

Vermilion Parish. Table 4 compares cost between the chrome lignite-chrome lignosulfonate mud and the gyp mud. This comparison is drawn from two 11,500-ft. offset wells in Vermilion Parish, Louisiana.

In this case, the CL-CLS mud saved $9,416.39 in mud cost. Moreover, the five 9⅞-in. bits saved meant a cost reduction of $1,175. The 4½-hour saving in rotating time is valued at $225. Thus, total saving on the well was $10,816.39.

The area of drilling is one of development; both the operator and the contractor had previous experience in the area. They could also draw on the experience of others. It is apparent, then, that good use of the CL-CLS system can save

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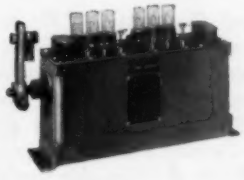

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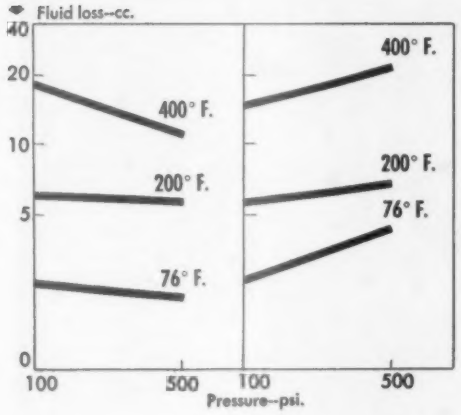


COMPRESSIBLE filter cake of the CL-CLS mud is evident from the down slope of fluid loss as pressure increases. This fact indicates better downhole filtration control than in calcium-treated mud at right which has up-sloping curve. Fig. 2.

mud, barite, and mud-chemical costs. Also, the mud can help register a saving in bits and time.

Preparation and Maintenance

Having seen that the CL-CLS mud system is both simple and money saving, let us now look at how this type mud is prepared and maintained in the field. During tophole drilling, conventional mud practices should be followed making use of drilling detergent, light treatments of caustic lignite or caustic quebracho, and phosphate. While drilling this interval, bentonite should be added regularly to provide good base solids for the chrome lignite - chrome lignosulfonate system.

Immediately prior to the point of conversion or intensive treatment, phosphate should be added through the chemical barrel to knock the fluff out of the tophole mud. Doing so insures against converting muddy water. After the phosphate is added, the viscosity in the pit should be checked and, if necessary, bentonite should be added to increase the viscosity to 40-45 seconds per quart.

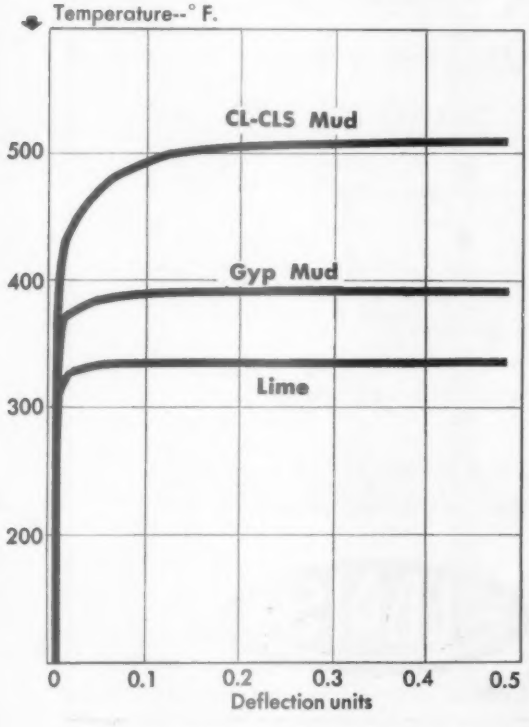
Immediately following the bentonite, add 4 lb. per bbl. chrome lignite, and 8 lb. per bbl. chrome lignosulfonate, and approximately 2-2½ lb. per bbl. caustic soda. Following conversion, an unweighted mud system should weigh 9.8 to 10.0 lb. per gal.; funnel viscosity should be 38 to 40 seconds per quart; and fluid loss should be 3.0 to 5.0 cc.

If fluid loss is above 5.0 cc. or if viscosity is below 38 seconds per quart, more bentonite should be added immediately. After the mud has come to equilibrium, the pH should be about 9.5 and filtrate alkalinity adjusted to 0.3 cc. Oil may be added the same as to any other mud.

Tourly treatment. As long as drilling is relatively fast, the tourly treatment should include about 250 lb. of chrome lignite and 500 lb. of chrome lignosulfonate plus 200 lb. of caustic. As drilling slows down, less chemical is needed.

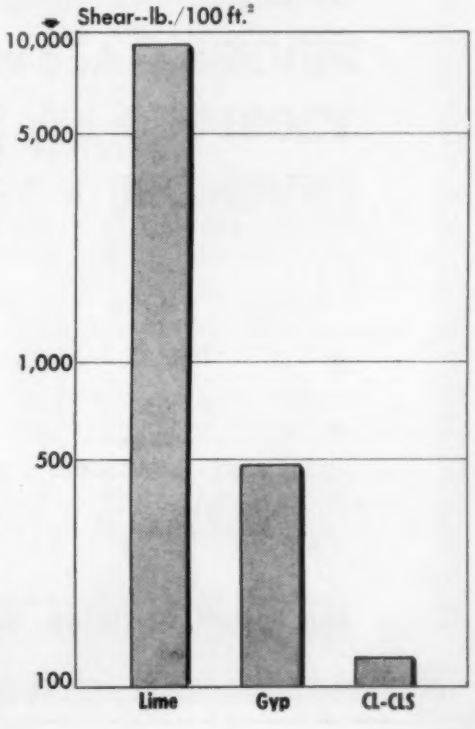
The important feature is that the CL-CLS system can be tailored to meet conditions as needed simply by varying the concentration of chrome lignite - chrome lignosulfonate. If the mud requirements are not severe, only moderate chemical concentrations are necessary. On the other hand, where extremely high temperature stability and a low water loss are essential, just step up the treatment.

During relatively fast drilling and before conversion, approximately six sacks of bentonite should be added daily. As weight increases and drilling rate slows down, amount of ben-



HIGHEST temperature-pumpability limit is that of CL-CLS mud in series of tests run in modified cement consistometer. Temperature limit of 560° F. was measured for one CL-CLS field mud which measured 17.5 lb. per gal. and had 36% solids by volume. Fig. 3.

LITTLE gel strength develops in the CL - CLS mud after being aged at 300° F. for 16 hours. The gyp mud is less gelled than the lime but is not so good as the CL-CLS system. Lack of gelling with aging means CL - CLS system can be used successfully as packer mud. Fig. 4.



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tonite should be cut to two to three sacks a day.

For routine drilling, adequate concentrations of chrome lignite and chrome lignosulfonate should be maintained with tourly treatments, using a ratio of one part chrome lignite to two parts chrome lignosulfonate.

Adding water. Amount of solids in any type of mud has to be controlled with water. Too many solids slows down drilling rate, upsets flow properties, and makes the mud less stable to temperature. Optimum solids concentration of a CL-CLS mud may be calculated by subtracting 6.7 from the mud weight and multiplying by 3.5.

Water additions should be made to control the mud solids at the optimum point as calculated by this formula. Water - meter readings on a number of CL-CLS mud systems have shown an average use of 0.4 bbl. of water per foot during the drilling of the wells. Remember that all water should be added above or below the shaker, not on the screen.

Products used. Because of the simplicity of the CL-CLS system, only a few materials are needed. In addition to the basic materials, chrome lignite - chrome lignosulfonate, caustic, barite, bentonite, and water, only the following materials are recommended:

1. Sodium bicarbonate—Use to pretreat for cement contamination.

2. Clay—Use when building new volume.

3. Drilling detergent—Used in top hole to reduce balling and to drop out sand. Used in bottom hole to speed drilling rate, eliminate balling, and reduce torque.

4. E.p. additives—Used for lubrication and torque reduction. May be used with or in place of diesel oil. Allows operator to run higher bit weights.

5. Lost - circulation material — Used for preventive loss of mud and corrective loss of returns.

Some rules of thumb—which will help the field man get the best performance from his CL-CLS system:

1. Watch the difference in funnel viscosity between flow line and pump suceion. A difference of more than 10 seconds indicates need for higher concentration of chrome lignite and chrome lignosulfonate, or for reducing the solids.

2. Compare viscosity off bottom after a trip to viscosity at the flow line before the trip. If the increase is more than 20 seconds, increase concentration of CL-CLS and reduce total solids with water.

3. Increase concentration of CL-CLS and bentonite if the wall cake is soft or sticky.

4. Expect yield point to be approximately the same as mud weight. That is, in an 18-lb. per gal. mud, yield point should be 18 lb. per 100 sq. ft.

5. Don't assume low fluid loss will impair drilling. In problem areas the CL-CLS mud API filter loss usually runs about 2.0 cc. or less. Many wells drilled with CL-CLS muds of 2.0 cc. or lower water loss have less trouble, use fewer bits, and take fewer rotating hours than offset wells drilled with other muds of 5.0 cc. or higher water loss.

6. Make initial additions of materials in the concentration recommended. This is essential for the CL-CLS muds to perform properly. Subsequent treatments should maintain concentrations needed for stable mud properties. Remember, the concentration required varies with the severity of the conditions.

Supporting Laboratory Data

The CL-CLS system has been thoroughly tested in the laboratory. On tests of "inhibition" the CL-CLS system looked especially good. Previous so-called inhibited muds all contained added calcium salts. Such fluids have been used to drill bad shale sections in hope of avoiding hole problems.

With all water-base muds, there is some filtrate loss. Therefore, inhibition to the formation is a matter of degree. A truly inhibited mud is one with **no** adverse effect on the formations. It follows that an inhibited mud must have little filtration so there is little formation wetting. It is the volume of filtrate lost to the formation, as well as the ions in solution, that contributes most to shale problems.

A mud must be conditioned so that it stabilizes mud solids against the effects of high temperature and contamination.

Inhibition tests. A series of tests was run to compare the inhibition

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of the CL-CLS system to that of gyp muds. In these tests, cubes of crude Wyoming bentonite and Atoka shale were immersed in filtrates typical of each mud.

After 24 hours, the bentonite cubes were examined. Volume of the cubes had increased due to fluid absorption, but with the increase showing about the same for both systems. However, the surface of the cube exposed to the CL-CLS environment was smooth; surface of the gyp - filtrate - exposed cube was grainy and contained cracks.

The Atoka shale cubes were exposed to the filtrates for a total of 19 days with distilled water used in comparison. In distilled water the cube cracked immediately and began to fall apart in 3 days. In gyp filtrate the cube remained intact 5 days before cracks appeared. In the CL-CLS filtrate, the cube stayed intact 12 days before cracking at all, and at the end of 19 days, cracking was still minor.

Filter tests. Filter loss of mud is important since high water losses can aggravate sloughing shale and pressure-differential sticking of drill pipe. Moreover, many producing formations are damaged by too much filtrate. All in all, many of the troubles in drilling can be attributed to filtration from the mud and to the solids which deposit on the hole as a result.

Our usual method of measuring fluid loss is the API wall tester which measures filtration rate at a 100-psi. pressure differential. The API tester has long been used as a standard to judge mud filtration in field drilling.

It is unfortunate that the API filter test does not represent what actually occurs downhole. This particularly is true with calcium muds. The calcium-treated mud suffers a big jump in filtrate loss at high temperature. Reason is the strong flocculating effect of the calcium ions and the degradation of filtrate-control materials. Thus, many calcium-inhibited muds have failed because the filtration control agent broke down under well temperatures.

Since high-calcium muds became popular, stuck drill pipe has become more frequent. It's true that some of the fishing jobs can be blamed on key seating and caving of shales. But many of the fishing jobs result from differential-pressure sticking. When such sticking is analyzed, the conclusion almost invariably is that water loss was too high downhole.

It is important to remember, then, that the API fluid loss does not always correlate with the high-pressure, high - temperature fluid loss. Remember also that the situation is especially true with calcium-treated muds.

Even the very first field test of the CL-CLS system showed it withstands high temperature better than previously used muds. The high-pressure fluid loss remains low. There are several reasons for this:

1. Bentonite is used to give a good particle - size distribution as well as to build a filter cake that is compressible under high-pressure differential.
2. There are no unstable organic filter-control agents in the system.
3. The low-filtrate calcium helps keep flocculation down. As a result, less organic dispensant is needed for stability.
4. The system is well dispersed. Clay particles can orient themselves to form an impermeable wall cake.

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It is easy to show that the properly conditioned CL-CLS mud has a very thin, compressible filter cake. This can be done by measuring filter loss at some high temperature and at gradually increasing pressures. The typical filtration graph shows a downslope. On the other hand, a calcium-treated mud shows an upward slope. The downslope shows a compressible filter cake and good filtration control.

Temperature stability. There are some important advantages to running a mud with the lowest practical plastic viscosity and yield point. Some of these advantages are better hydraulics, faster drilling, less swabbing on trips, smaller pressure surges, less frequent loss of circulation, and cheaper mud bills.

In order to check stability and flow characteristics of the CL-CLS mud at high temperatures and pressures, a cement consistometer was specially modified to test muds at temperatures of 600° F. and pressures to 10,000 psi. Thus, the device gives an accelerated test all the way from room temperature up to the point where each mud gels too severely to be pumpable.

Temperature during the test period where the mud begins to get and get thick is referred to as the temperature limit. Moreover, the equipment can be cycled for long time intervals at any constant temperature below the gelation temperature. This cycling test shows if the mud holds up for long periods as it must when in the hole during logging jobs or well testing.

The consistometer tests have dramatically shown that the temperature limits of various muds are affected by such things as concentration of low-gravity solids, soluble calcium, mud alkalinity, and residual concentration of dispersant. The tests have also shown that high solids and alkalinities have less effect if the mud has a relatively high concentration of chrome lignite and chrome lignosulfonate.

Temperature limit of a CL-CLS field mud has been measured as high as 560° F. This was a mud weighing 17.5 lb. per gal. having 36% solids by volume.

In more than 250 tests comparing field muds, temperature-pumpability limit for a CL-CLS mud was invariable higher than for lime and gyp system.

Stability of the CL-CLS system at high temperature is further shown by shear tests made after exposure at 300° F. for 16 hours. As would be expected, the gyp mud was much better than the lime mud, but neither was nearly as good as the CL-CLS mud.

The high-temperature gelation of a heavily calcium-treated system is not reversible. A CL-CLS mud with a temperature limit of 480° F. exposed to 300° F. static for 48 hours stirred back to a fluid quite easily. Flow properties of the mud were nearly the same as before testing.

If a good mud is used correctly, the payoff is in reduced drilling costs.

Good Mud Practices

Here are some good practices that insure lowest possible drilling cost:

1. Ask only for the mud properties you actually need. Too often, people demand mud characteristics simply because they've been doing it that way for years. The truth may be that they have been doing it wrong for years. Two of the properties most commonly asked for are high mud weights and lower fluid losses. On a well in South Louisiana,

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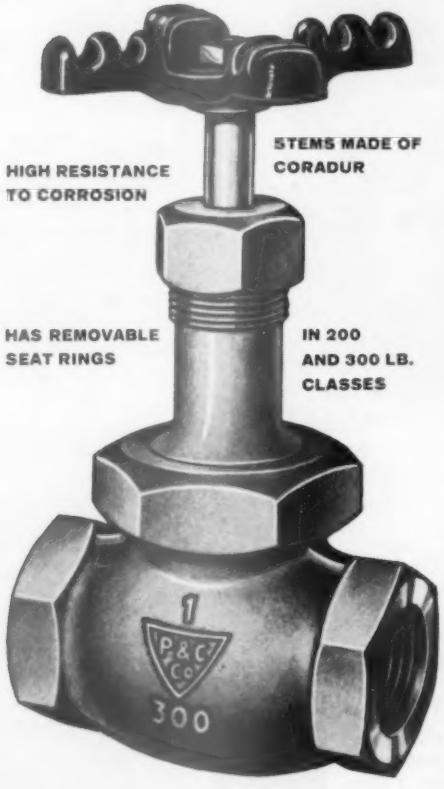

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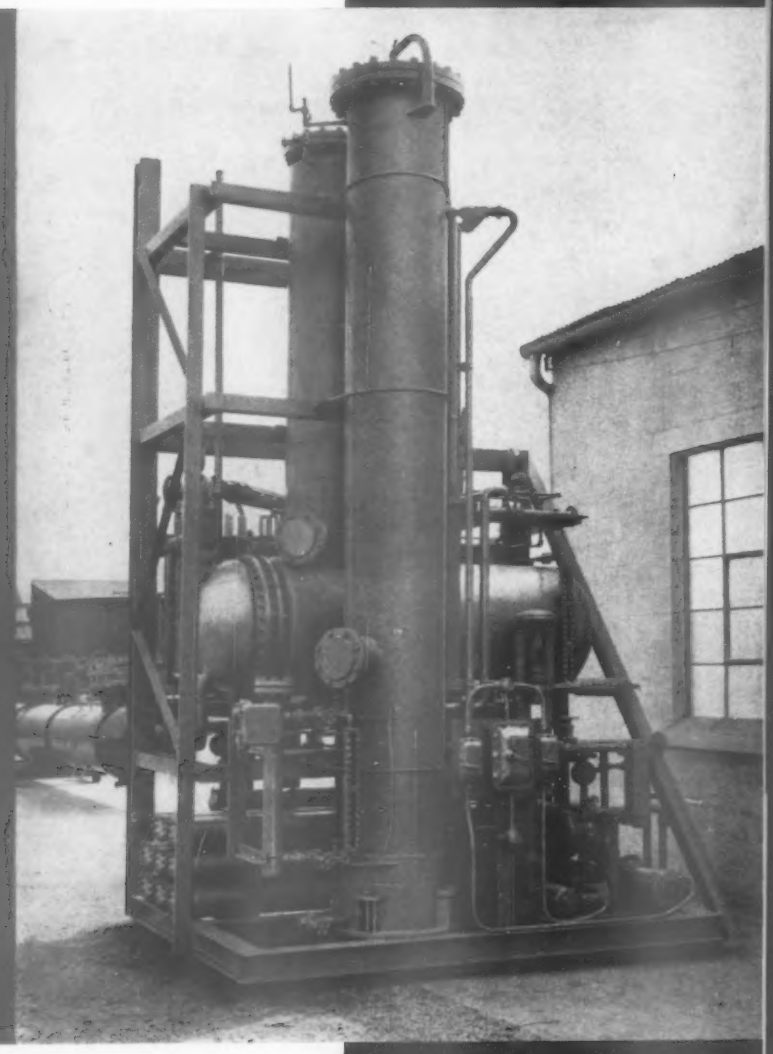

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for example, the fluid loss was 2.0 cc. and the hole was in excellent condition. When an arbitrary demand was made for lowering the fluid loss to below 1.0 cc., hundreds of dollars were wasted getting the job done when, really, a lower fluid loss was not required. Believe it or not, a mud with 4.0-cc. API fluid loss can have a better fluid loss downhole than another mud with a 2.0 cc. API fluid loss.

2. Delay conversion as long as possible. Tophole mud with good properties should be carried to the deepest possible depth. Too often, conversion is made at relatively shallow depths even though hole conditions don't require it until after the protective pipe has been set. If the conversion is delayed to pipe-setting depth, mud volume will be smaller.

3. Improve tophole mud with minor chemical treatments. Proper treatments of tophole mud helps reach contract depth safely and cuts down equipment damage caused by sand. Preconditioning also saves money downhole. Conversion of a mud which is in good shape gives a mud that is more stable and at less cost for chemical treatment. An example is the use of bentonite to provide proper base solids for conversion. Keeping the tophole mud in good shape may allow deeper drilling before conversion.

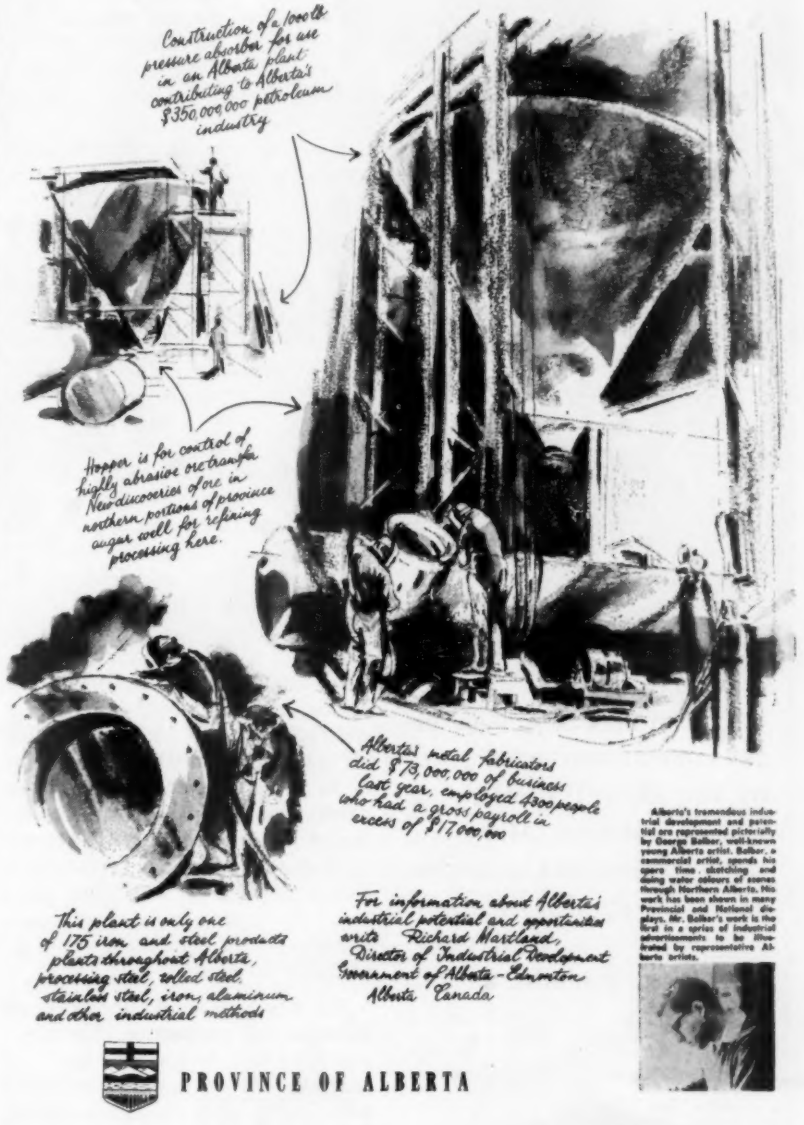
4. See that rig equipment can carry out the mud program. What's the sense in having a good program when the rig, pumps, pits, and the like can't handle it properly. Have the right equipment for the job to be done. For example, a small, 20-bbl. slugging tank will cut barite costs when slugging the mud before trips.

5. In field development drilling, reevaluate the mud properties systematically. Expensive mud problems can be headed off by evaluating the past wells in known areas. Use the case histories available from other operators or mud companies. Consult these files when setting up the drilling program.

6. Use mud additives which are compatible with the base system. Quite often we find someone adding expensive specialty products to a mud without the recommendation of a reliable mud company. Unfortunately, some of these products are not compatible with the mud. The result is extra expense in mud maintenance materials. Two materials which have been causing trouble recently are asphaltic emulsions and heavy residium oils. Diesel oil and bentonite do a better job for less money. Some materials have a side effect of upsetting the chemical balance of the mud, which increase viscosity so that more water, barite, and chemicals must be added.

7. Think about lost circulation before treating it. There is no need to waste days and dollars before pinpointing a loss zone. Find the zone before wasting a lot of expensive mud, then use the correct size lost-circulation materials. If the loss is complete, fine mica or other fine-particle-size materials won't help. Lost-circulation materials made by mud companies are designed for specific conditions.

8. Use the centrifuge sparingly, as it was intended to be used. The only reason for renting a centrifuge or cyclone separator is to recover barite from excess mud while drilling. Overcentrifuging reduces chemical concentration in a mud and up-


Construction of a 1000 lb pressure absorber for use in an Alberta plant contributing to Alberta's $350,000,000 petroleum industry
Hopper is for control of highly abrasive ore transfer. New discoveries of ore in northern portions of province augur well for refining processing here.
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For information about Alberta's industrial potential and opportunities write Richard Martland, Director of Industrial Development, Government of Alberta - Edmonton, Alberta, Canada
Alberta's tremendous industrial development and potential are represented pictorially by George Balber, well-known young Alberta artist. Balber, a commercial artist, spends his spare time sketching and doing water colours of scenes through Northern Alberta. His work has been shown in many Provincial and National displays. Mr. Balber's work is the first in a series of industrial advertisements to be illustrated by representative Alberta artists.
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Corban® polar-type corrosion inhibitor is offered in 14 varieties to meet and combat both sweet and sour oil and gas well corrosion.

Corban is available in three forms: ready-to-use liquid, concentrated liquid, and sticks 18 inches long and 1½ inches in diameter. Some types of Corban are soluble in oil. Other types are soluble or dispersible in fresh water or brine.

Corban may be applied in any conventional manner, or by the Dowell-developed squeeze technique. Many operators depend on Corban for excellent results with low treating costs. Call your Dowell representative for full information.

PRODUCTS FOR THE OIL INDUSTRY

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sets the particle-size distribution which is essential to good filtration properties. The result is that money is wasted and the hole is less stable. Any chance of upsetting the circulating system can be avoided by storing excess mud in a duck's nest or in an extra pit.

9. Remember how much mud materials cost when handling them on the surface. There's an appalling waste of mud materials on many locations as a result of spillage, poor storage, and exposure to weather. Make the investment in good storage and handling equipment. Stack the most frequently used materials near at hand.

10. Add water above or below the shaker screen, not on it. If water is added over the screen, the shaker can't remove cuttings and drilled solids effectively. Water added over the shaker screen washes through many fine cuttings which are carried back into the mud system. The result is that more water, barite, and chemicals must be added to the system.

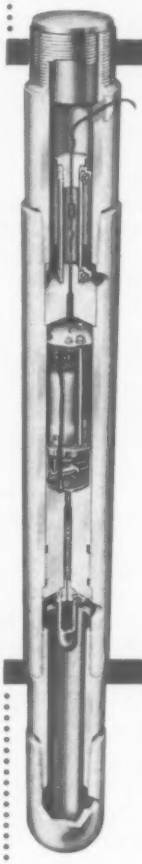
11. Use water wisely. Mud need not be complicated. Some of the most important factors in good mud practice are actually the simplest. As an example, uniform additions of water make mud solids and properties much more stable and reduce fluctuation of the over-all performance properties of the mud.

All of us know that water is the best chemical for use in mud, but actually it is also the most abused one. It is frequently easier to get chemicals added to a system than water, yet it is water which controls solids content, which in turn affects drilling rate. It would be wise for contractors to adopt a procedure for adding water while circulating. A means of accomplishing this would be to rig up a flowmeter actuated by the circulating pump. With the pump running, the flowmeter could be set to deliver water at a rate recommended by the mud engineer. This equipment could be installed at nominal cost.

12. Carry good practices on through well completion. The operator who fails to continue his good practice during completion likely will pay the price of extra swabbing time and completion delays. A good packer fluid left in the hole means later workovers will be easier.

Permanently Installed

BOTTOM-HOLE PRESSURE GAUGE



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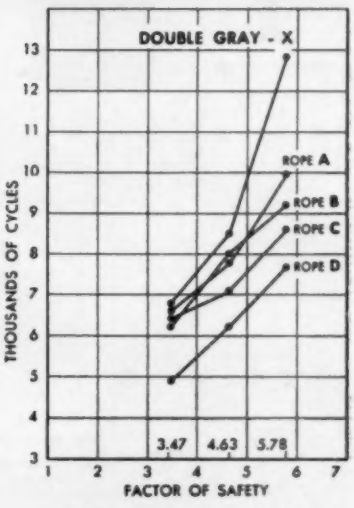
CF&I-Wickwire is making the wire rope of *tomorrow...today*. It's Double Gray-X —the rope with the molecular shield of molybdenum disulphide.

In an extended series of tests on a 25,000-lb. fatigue machine, CF&I-Wickwire's Double Gray-X outlasted four other major brands of high-strength rope at all three of the safety factors used. At the highest and most commonly-used safety factor, Double Gray-X had 45% more bending life than the average of other ropes tested. (Please see the chart at right.)

We'd like to give you some additional information on these tests . . . let you read some enthusiastic field reports from satisfied users . . . and show you how the molecular shield on Double Gray-X can help reduce your equipment-downtime costs. Contact your nearby CF&I sales office or distributor today.



All test ropes were ½" 6 x 25 FW Preformed E.I.P.S. Lang Lay IWRC.

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Dri-flo Orifice Meters in recording, indicating and integrating models assure maximum accuracy in differential pressure measurement.

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Series A-88 Controllers accurately control continuous process variables.

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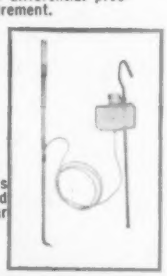
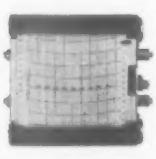
The ideal air or gas-operated instrument power drive and timing unit for remote installations.

4 CANNON METER PENS



Controlled-flow meter pens prevent chart smearing and blurring. Record up to a year without refilling.

5 STRIP CHART RECORDER



Provides a long, unattended record with high resolution for accurate interpretation.

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Tone-frequency and multiplexed Telemetering Systems meet the individual requirements of any system.

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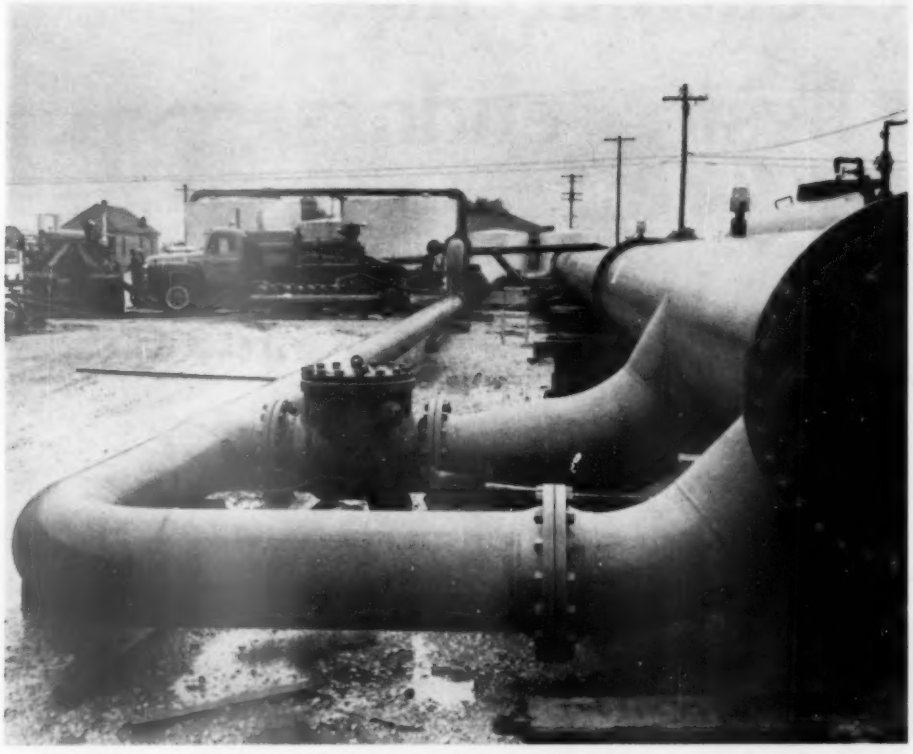


YARD - WIDE PIPE is used for world's biggest calibrated-pipe piston meter prover.

Huge meter prover goes to Libya

WHAT IS BELIEVED to be the largest calibrated-pipe, piston meter prover ever built has been constructed by J. A. Halpine & Son, Inc., Tulsa, for Esso Standard (Libya), Inc.

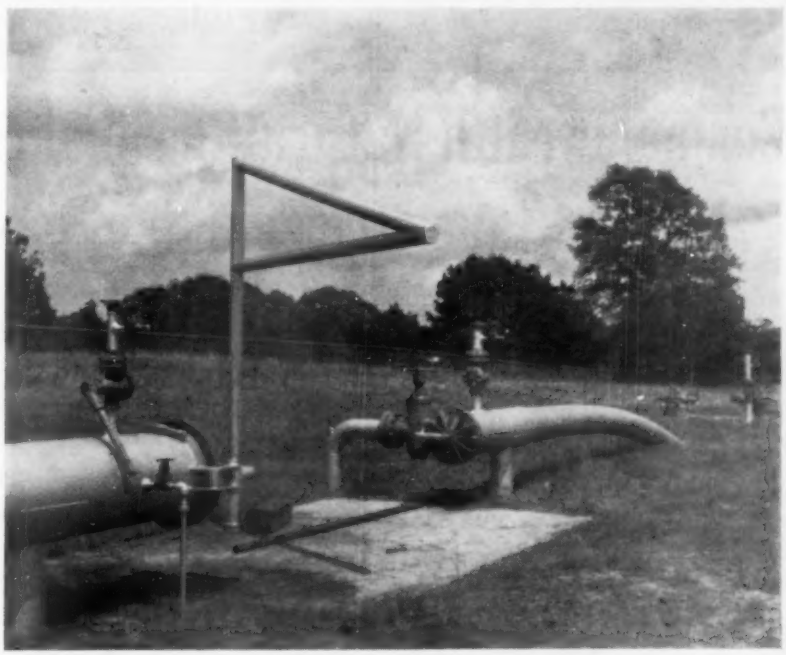
The calibrated pipe is 36 in. in diameter and 160 ft. long. Its manifold is made up of 16 - in. line.

The prover is shown here being tested at the Halpine yard before shipment to Libya.

Swing speeds pig transfer

INSTALLATION of a swinging cantilever boom above the outlet and inlet of a pig trap speeds up the transfer of the pig when it is removed from the pipeline for inspection and reconditioning. In normal operation, a frag is set in the line and the stream directed through the bypass containing the trap. After the pig enters the bypass or dog leg, that section of the line is bled down, the line opened and the pig removed.

The swing is used to transfer the pig from the outlet of the section that has been scraped to the inlet of the section to be pigged. The swing is set in a concrete platform which makes for good working conditions in any type of weather.



Repeat purchases —the best endorsement for Polyken

1956 INSTALLATION, Chester to Bellwood, Va., 4.5 miles of 6" pipe

1960 INSTALLATION, Boswell's Tavern to Gum Spring, Va., 26.7 miles of 18" pipe

Commonwealth Natural Gas makes repeated use of Polyken® tape on strength of past performance

Officials of Commonwealth Natural Gas Corporation of Richmond, Va., were impressed in 1956 with the many advantages of Polyken protection. With confidence based on the cathodic protection needs of their Polyken tape-coated 1956 Bellwood line (*inset photo*), they put this coating to work two years later on their Chester to Petersburg, Va., line (12 miles of 18" pipe). In 1959, *more* Polyken coating . . . Waverly to Ivor, Va., (15.8 miles of 12" pipe). And most recently, the line from Boswell's Tavern to Gum Spring (*main illus.*).

It stands to reason that repeated use is founded on first-hand satisfaction and trust. Many discriminating companies make Polyken protection their standard specification because of its dependable performance. Get full details on Polyken performance and economy from your representative, or write Polyken Sales Division, 309 West Jackson Boulevard, Chicago 6, Illinois.

Polyken

EXPERIENCED IN PROTECTIVE COATINGS

THE KENDALL COMPANY
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Experienced in modern PROTECTIVE COATINGS

Revenues increase faster than sales

REVENUES of interstate natural-gas pipeline companies continue to increase faster than sales. Total operating revenue for August, this year, was $274,803,389. It compared with $255,891,163 for August 1960, an increase of 7.4%.

Sales, both to ultimate consumers and to other companies for resale, totaled 710.3 billion cubic feet in August. This compared with 696.6 billion cubic feet for August 1961, an increase of 1.97%.

August sales this year consisted of 140.4 billion cubic feet to ultimate consumers, down 7.5% from last August, and 569.9 billion cubic feet to other companies for resale, up 4.6% from a year ago.

Net income was up 6.8% in August. It was $21,630,235 in that month compared to $20,243,848 in the same month of 1960.

Biggest percentage increase in factors affecting profit was in taxes. The companies paid $28,580,874 in taxes in August against $21,668,523 a year earlier. This was an increase of 31.9%. The largest increase was in federal income taxes, up 48.9% from 1960.

Operating expenses were up 5.6% in August. They totaled $181,006,899 in the eighth month this year against $171,388,550 in the same month of 1960.

Solid-state system to control pipeline

USING techniques similar to large-scale solid-state digital computers, Control Corp., subsidiary of Control Data Corp., will eliminate the gap that has existed between conventional control systems and computer-controlled closed-loop systems.

The Control Data 8000 Series solid-state systems will control the flow of natural gas of the pipeline complex of Texas Eastern Transmission Corp. which extends from Northwest Louisiana to New Jersey, with numerous lateral branches.

In the initial installation, a master station and three satellite stations will be joined by a common digital-computer language operating over microwave communication channels. The ultimate system is planned to comprise 128 satellite stations and a computer at the master station.

The master dispatching control center will be located at Shreveport, and the initial satellite stations at Berne, Ohio, West Monroe, La., and Danville, Ky.

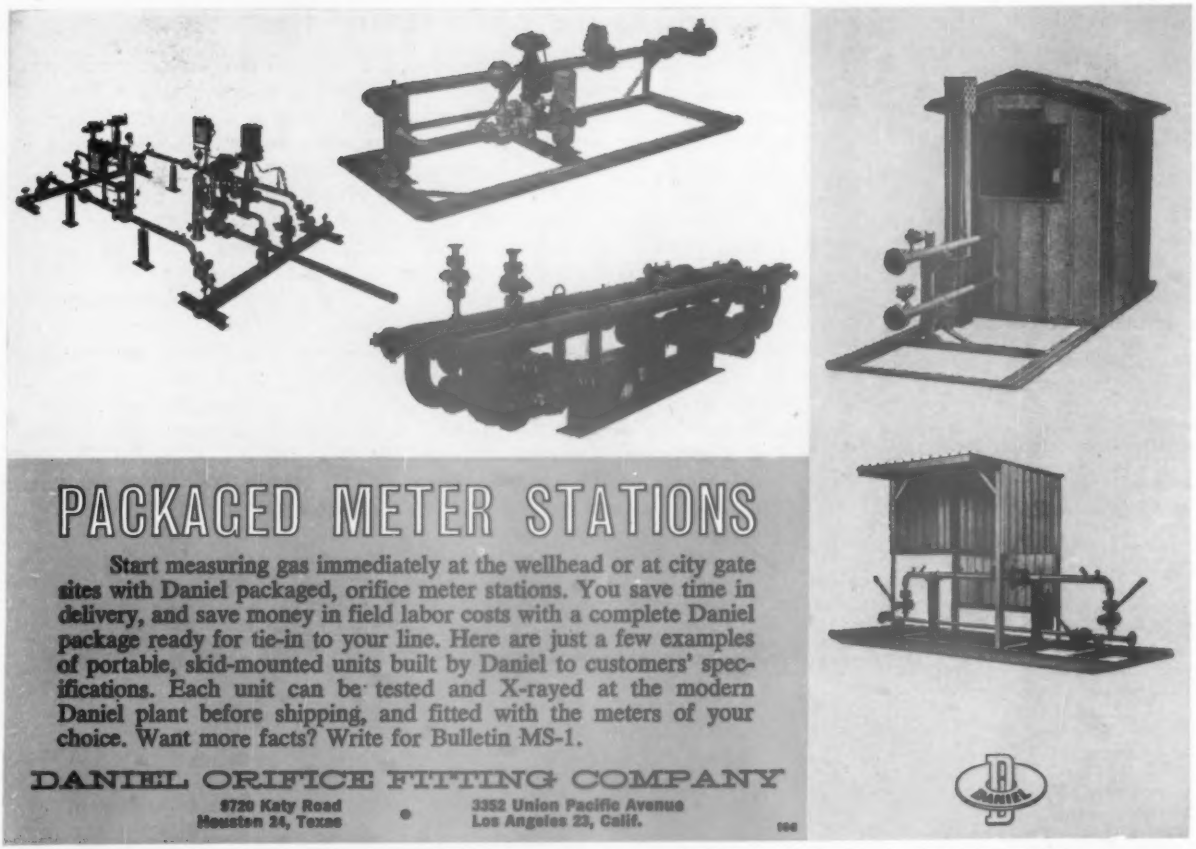
Information will be transmitted from each satellite station and logged periodically. The recorded data includes: Alarms, suctiton pressure, discharge pressure, number of compressors operating, number of compressors available, number of compressors unavailable, station maximum capacity, station electric power, and gas flow.

The dispatcher will enter his set points and control functions through thumb-wheel switches mounted on the console. Each entry is also printed out on the typewriter. Prewired programers will be installed at each station and will communicate with the dispatch center through digital transmitter-receivers over microwave channel.

Functions of the system are:

1. Transmit operational requirements concerning pressure and gas flow from the dispatch center to the satellite stations.
2. Provide continuous scanning of all pertinent data and controlled devices and indicate offnormal or upset conditions through audio, visual, and logged methods.
3. Initiate station or system log hourly, on demand, or during station upset.
4. Furnish interface compatible with digital computer to adapt future closed-loop control and billing features.

In designing the system, speed, security, adaptability, and flexibility were the most demanding requirements. In the ultimate 128 station system, the scan cycle will take only 32 seconds. The dispatch programer will interrogate each satellite station programer in sequence. If no upset condition exists, the next satellite station programer is interrogated. Where an upset condition exists, a



PACKAGED METER STATIONS

Start measuring gas immediately at the wellhead or at city gate sites with Daniel packaged, orifice meter stations. You save time in delivery, and save money in field labor costs with a complete Daniel package ready for tie-in to your line. Here are just a few examples of portable, skid-mounted units built by Daniel to customers' specifications. Each unit can be tested and X-rayed at the modern Daniel plant before shipping, and fitted with the meters of your choice. Want more facts? Write for Bulletin MS-1.

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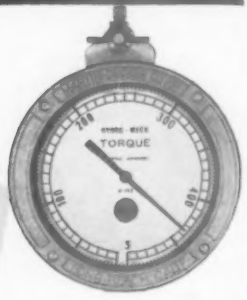
ROTARY TORQUE

for DOWN HOLE VISION



A good Weight Indicator is not enough. For complete knowledge of down hole conditions install the Martin-Decker Hydro-Mech Torque Assembly. This unit fits under the rotary or secondary chain and provides sensitive indications of:

Hole and Bit Conditions
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handles all sizes of pipe—6 inches and up!

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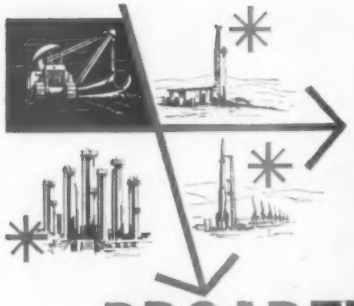

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40 heavy duty cardboard tubes 2" diam., 36" long.

BIN: 22" x 9" x 27⅜"

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station log is initiated for that particular station.

Provision of a 100% parity check on the data-transmission provides the ultimate in data-handling security. By this means, errors introduced by the transmission circuit are detected, thus preventing false operations.

The use of a common digital-computer language simplifies the adaptability for computer monitoring. Additional advangtages include system simplification, fewer chances of error in transmitting, and fewer components, which results in greater reliability and much more versatility in programing data orders.

Flexibility for adding stations and to use a party-line microwave communication circuit was attached by expanding the system word to include: Station address (up to 399 stations), function (or point) address (up to 99 points), and data or control value (0-9999 decimal).

In each station the design is based upon building-block concept, a technique used throughout Control Data's system. This results not only in the advantages, but also simplifies maintenance.

The new control system is part of an $83 million expansion program of Texas Eastern Transmission Corp. to provide for delivery of an additional 225 M.M.c.f.d. of gas.

FPC approves 1,561 miles of pipe

CONSTRUCTION certificates covering 1,561 miles of pipeline and 186,320 hp. in compressor station capacity were issued by FPC during the first 8 months of 1961. These projects had an aggregate value of $234,929,000.

Applications still before the commission covered 6,065 miles of pipeline, 492,838 hp. in compressor station capacity and had a total value of $743,829,194.

This is the month-by-month FPC record for 1961:

Month	Miles of pipeline	Compressor hp.	Dollar value
January	7	2,400	$ 21,297,214
February	33	0	3,346,262
March	126	5,400	20,514,274
April	2	0	3,346,262
May	333	41,650	69,787,010
June	550	23,660	63,053,276
July	141	58,950	25,310,459
August	359	54,260	28,135,499
1961	1,561	186,320	234,929,150

WHEN YOU ENCOUNTER EXCESSIVE TORQUE, DRAG OR THE HAZARD OF STICKING DRILL PIPE AND CASING....

SOUTHWESTERN 92 FLAKE GRAPHITE

excellent dry lubricant • inert • compatible with any mud • mud rheology unaffected • mixes readily • inexpensive • minimum graphitic carbon 92% • durable, weather-resistant 50-lb. bags

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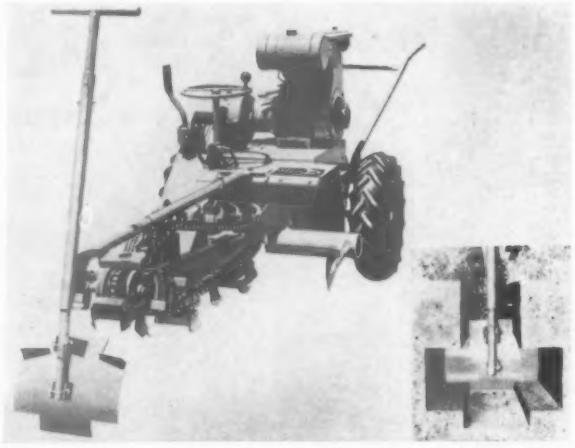
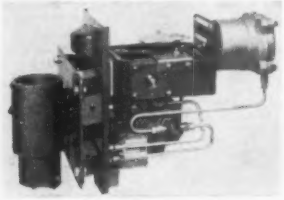
NEW EQUIPMENT



Trencher attachment cuts footings

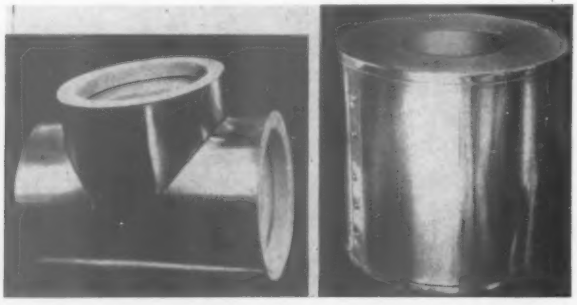
THIS T-footing cutter can be mounted on the maker's trenchers, Series M3 or M4, rubber-tired or crawler-mounted units, where it will permit the operator to dig a foundation footing with an 8-in. stem and a 16-in. T-footing. For heavier jobs, a 12-in. stem and 24-in. T-footing cutter is available for the maker's Model K2, four-wheel-drive trencher. The footing cutter offers a way to reduce building costs by eliminating the need for forms. Source: **Charles Machine Works, Inc.,** 1959 West Fir Ave., Perry, Okla.



Computer measures flow ratios

Direct measurement of flow ratios is provided by this new VRC ratio computer which can replace a conventional ratio device and two square-root-extracting devices in flow - ratio pneumatic - control systems. Available in ratings of 3 to 5 psig., it can be applied to new or existing systems.

As an added safety factor, the instrument will sound an alarm or limit the flow of one liquid when ratios exceed a critical point. Output can be recorded, and it can be used as the measured-variable input to a controller. The set point or controlled flow ratio can be adjusted from a manual control station, from a measurement of total flow, or from an analysis of the characteristics of the final stream. Source: **Republic Flow Meters Co.,** 2240 Diversey Parkway, Chicago 47, Ill.



Aluminum covering for tees, flanges

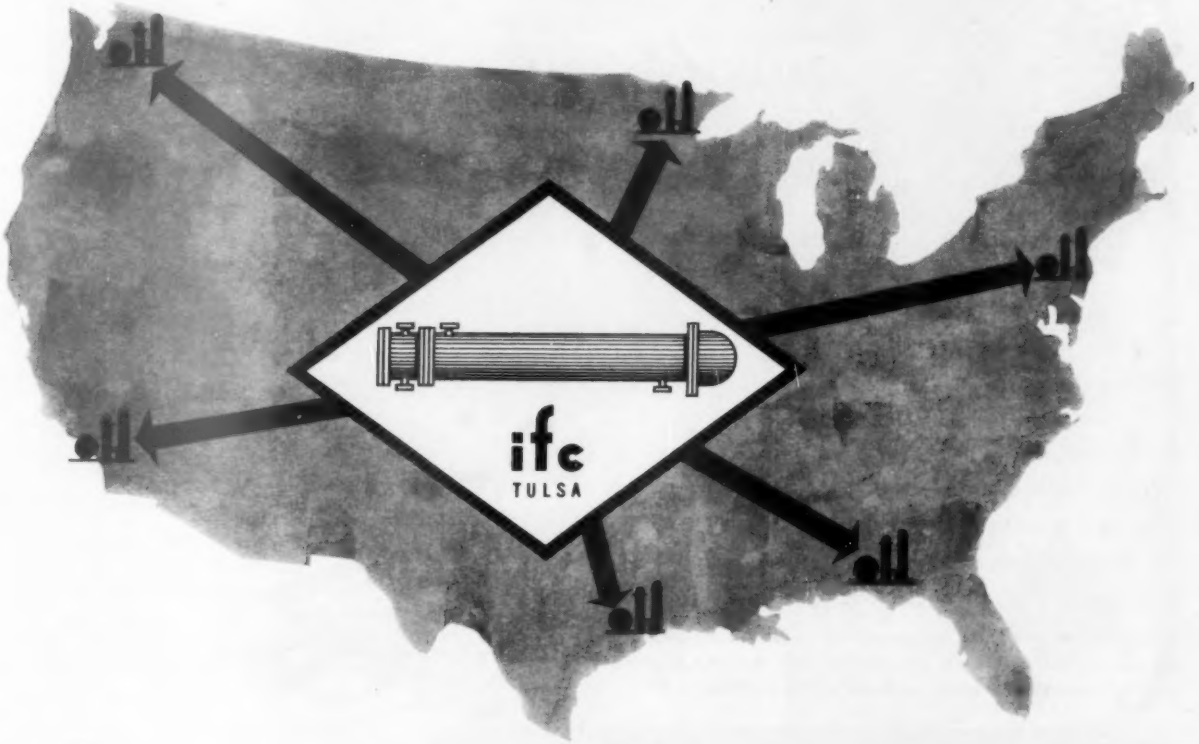
NOW YOU CAN COVER tees on insulated lines at what the maker claims to be a great saving in both time and cost, with this new preformed tee cover (at left in photo). Designed for use on both welded and screwed tees, the covering is furnished with calcium silicate, polyurethane, foamglas, or cork insulation attached. The tee has been designed for easy removal and reinstallation. A 2-in. extension of the tee covering forms a watertight seal with the jacketing on the adjacent pipe sections.

Screwed, weld neck, or blind flanges can now be quickly covered with a new preformed aluminum flange cover (at right in photo). Completely removable and replaceable, it comes with calcium silicate insulation applied to the inside surface. All the user is required to specify is size, temperature range, psi., and what type flange is to be covered. A watertight seal is provided by a 2-in. overlap that extends over the covering of the adjacent jacketing. Removable and replaceable in the field, covers can be removed to check for leaks, perform tests, or replace gaskets. Source: **Premetco,** Box 1134, Shreveport, La.

DISTANCE IS NO COST BARRIER...

at least not when the heat exchanger supplier is INDUSTRIAL FABRICATING COMPANY. IFC's competent staff of exchanger specialists assures the best economic design. This permits higher freight charges without destroying IFC's competitive position. Past experience indicates that IFC can economically ship to all corners of the domestic United States and to many more distant parts of the world.

Whether exchangers are of carbon steel or alloy construction, IFC's competitive position has been preserved through all of the Company's growth. This price advantage continues to serve our customer's best interests, while maintaining quality excellence in an increasingly competitive world market. Let us serve you in the field we know best . . . heat transfer equipment.



ifc **INDUSTRIAL FABRICATING COMPANY**

3159 SOUTH SHERIDAN ROAD • TULSA, OKLAHOMA
MAIL ADDRESS: BOX 4556 **Phone: NAtional 7-3110**

LOWER YOUR BUCKETS

Tortured by thirst...
Yet where they drifted, the Amazon carries
its fresh water many miles to sea.
To drink, they had only to lower their buckets! Many
times all it takes to succeed is to recognize
and take advantage of the opportunities around us.
There are so many...when we *look.*

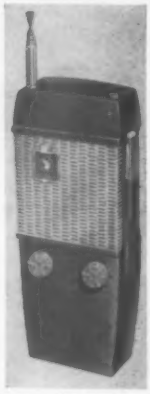
Gas and oil are where you find them. From Canada to the tip of South America our geologists probe the earth for both. Our 3000 producing wells now add to the flow of energy available to the Americas.

TENNESSEE GAS TRANSMISSION COMPANY

FROM NATURAL GAS AND OIL...HEAT, POWER, PETROCHEMICALS THAT MEAN EVER WIDER SERVICE TO MAN

HEADQUARTERS: Houston, Texas • DIVISION: Tennessee Gas Pipeline Company • SUBSIDIARIES: Midwestern Gas Transmission Company • East Tennessee Natural Gas Company • Tenneco Corporation • Tenneco Oil Company • Tenneco Chemical Company • Tennessee Life Insurance Company • AFFILIATE: Petro-Tex Chemical Corporation

Handy two-way radio



Known as the Personal Messenger, this transceiver should prove to be ideal for most any on-the-job application. Plant watchmen and security personnel should find the radio useful. It can also be used for personal paging in large plants. Housed in a rugged, high-impact case with an elastic carrying strap, the two-way radio may be carried easily in the hand or coat pocket. It's also obtainable with a leather carrying case and shoulder strap so that it may be carried like a camera.

Priced at $109.50, the radio requires no license for operation and may be used at once without an examination or filling out an application. The unit has also been designed for use with licensed Citizens' Bank equipment at extended ranges and meets all necessary FPC requirements for this type of operation, the maker reports. The radio is battery-powered and equipped with a plug-in battery case for either conventional pen-light cells or longer-lived mercury cells. Source: **E. F. Johnson Co.**, Waseca, Minn.

●

Rotary pressure switch

A rotary pressure switch (combined with a newly developed cam converter assembly which, through its rotary action, triggers a microswitch) permits the ganging of up to four of the rotary pressure switches, each capable of being triggered to operate at different pressure levels.

The RPS 17 switch actuates under pressures from 6 to 600 psig. and operates to pressures of 3,000 psig. Standard switch ratings are 5 amp. resistive, 3 amp. inductive at

let
VICTAULIC
cut your piping costs
NEW PLAINLOCK COUPLINGS AND FITTINGS
For Low Cost Jointing of Plain End Pipe
● Speed Installation — Save Time and Labor — Cut Piping Costs
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● Low cost couplings and fittings
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CUT COSTS WITH OVER 1100 VICTAULIC ITEMS FOR BETTER AND EASIER PIPING
Standard Couplings
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For complete information on any Victaulic product, write:
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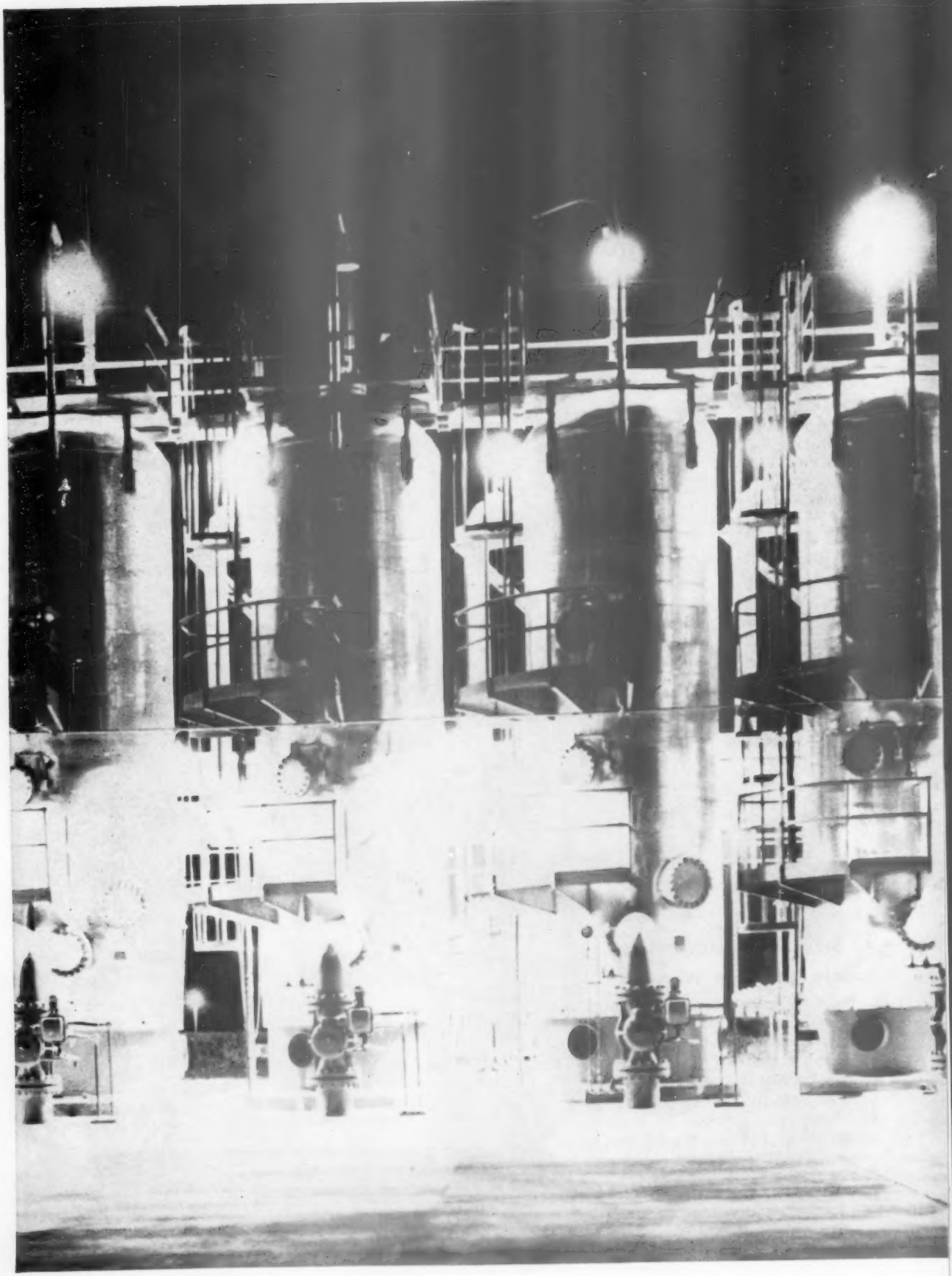
P.O. Box 509, Elizabeth, N.J.



DOW petroleum industry chemicals

GAS PROCESSING

COMPLETE DOW SERVICE HELPS MAINTAIN EFFICIENT GLYCOL DEHYDRATION SYSTEMS

For complete technical assistance on glycol systems for gas dehydration . . . or in controlling a rising dew point *before* it becomes a costly problem—call Dow.

For glycol dehydration troubles such as glycol degradation, corrosion, contamination, and excessive glycol losses, Dow representatives and distributors are available and can quickly obtain the services of technical personnel from Dow's Gas Conditioning Laboratory.

In addition, improvements in gas analysis and processing are constantly being made in the Dow Gas Conditioning Laboratory. Many of these may be useful to you in your own laboratory. One example: a simple, fast, accurate gas chromatographic technique that analyzes natural gas for troublesome components. Details on equipment and method are available on request.

Fast, efficient delivery of glycols for hydrate inhibition and dehydration as well as amines for sweetening, is assured by Dow's network of production plants, terminal facilities, and their distributor warehouses.

For Gas Conditioning problems of dehydrating, sweetening or hydrate inhibition, consult Dow. Call your nearest Dow sales office, or contact Dow in Midland, Michigan.

THE DOW CHEMICAL COMPANY DOW Midland, Michigan

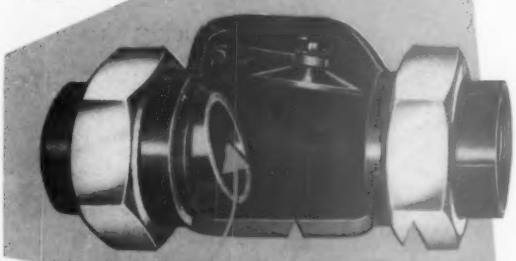
NEW DUCTILE IRON BODY

CATAWISSA "502" CHECK VALVES

1000 psi OWG 3000 psi Test
Sizes: 2" thru 4" N.P.T.

- COMPACT
- EFFICIENT
- ACCESSIBLE
- EASY TO INSTALL
- EASY TO INSPECT

for general flow line and pipeline use . . . horizontal or vertical



Here is one valve designed to take the rough handling necessary in most applications!

Metallographic structure of the ductile iron body resists leakage or seepage of liquids or gases.

FULL OPENING
DUCTILE IRON BODY
ASTM Spec. A-105, Grade 2, Forged Steel Union Ends

In production, pipeline or refinery use—the "502" has earned a reputation for long-life service and satisfaction . . . and now it's a better valve, a better buy than ever!

Catawissa "502" Check Valves withstand severe service conditions with built-in resistance to wear, shock or elevated temperatures. Their resistance to oxidation and a wide variety of corrosive media make them especially valuable where corrosion is a factor. Get the full story on all of their extra-value features!

There's no need to "beat a path to our door" . . . just write for Catalog 60 or call your favorite supply store!

CATAWISSA VALVE & FITTINGS CO.

CATAWISSA • PENNSYLVANIA

30 volts d.c. and 5 amp. at 125/250 volts a.c.

Available in aluminum, magnesium, or stainless steel housings, the switches are considered particularly suited for applications where gas or fluid pressures are to be converted to electrical outputs for warning or control systems. Source: **IMC Magnetics Corp.,** 917 W. Madison, Phoenix, Ariz.

•

Tool eases packing removal

Without proper tools, the removal of old mechanical packings in the maintenance of pumps and valves can be costly and time consuming. A line of all-steel packing tools is now available in sizes for all stuffing boxes and in two styles: flexible and rigid.

Where the strength of the tool is necessary to remove packing, the rigid tools are designed to be the answer.

The flexible packing hooks are constructed of two spiral steel shafts, one inside the other and wound in opposite directions. They can be particularly useful to remove packing from valves and pumps located in hard to reach places. Source: **Flexrock Co.,** 2417 Federal, Philadelphia 1, Pa.

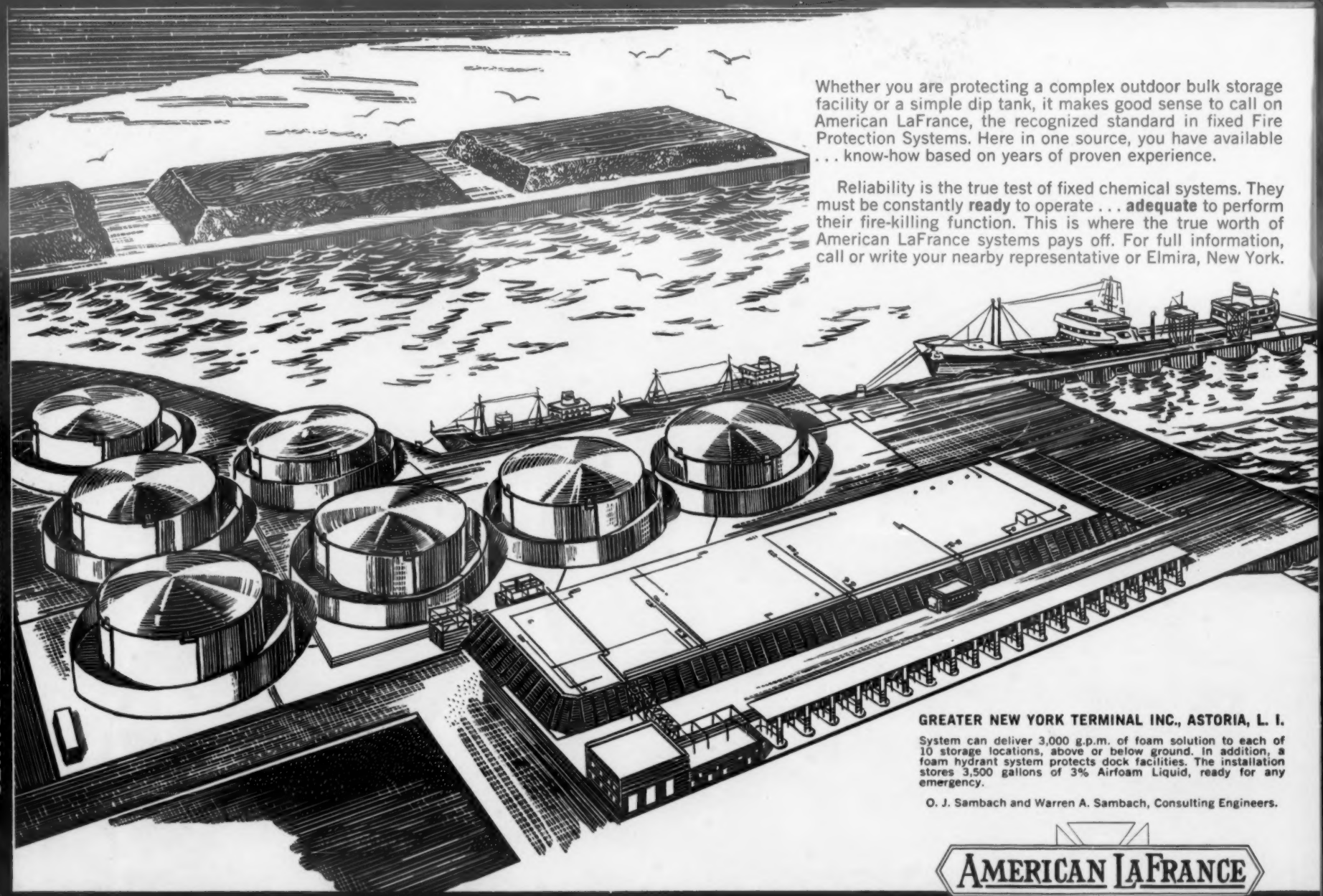
•

Plastic coating for work areas

When work areas of concrete or asphalt begin to crumble, soften, or erode, a new epoxy-fortified thermal-plastic coating may stop it. Called Driveway Magic, the product comes in several colors and can be put on with a stiff-bristle broom.

The maker says that a quick hosing with water will remove all ordinary dirt, and that the use of detergent makes it possible to brush off oil, grease, and tire marks. Source: **Driveway Magic Chemical Co.,** 3951 Medford, Los Angeles 63, Calif.

• FIRE PROTECTION WHERE AND WHEN IT COUNTS •



Whether you are protecting a complex outdoor bulk storage facility or a simple dip tank, it makes good sense to call on American LaFrance, the recognized standard in fixed Fire Protection Systems. Here in one source, you have available . . . know-how based on years of proven experience.

Reliability is the true test of fixed chemical systems. They must be constantly **ready** to operate . . . **adequate** to perform their fire-killing function. This is where the true worth of American LaFrance systems pays off. For full information, call or write your nearby representative or Elmira, New York.

GREATER NEW YORK TERMINAL INC., ASTORIA, L. I.

System can deliver 3,000 g.p.m. of foam solution to each of 10 storage locations, above or below ground. In addition, a foam hydrant system protects dock facilities. The installation stores 3,500 gallons of 3% Airfoam Liquid, ready for any emergency.

O. J. Sambach and Warren A. Sambach, Consulting Engineers.

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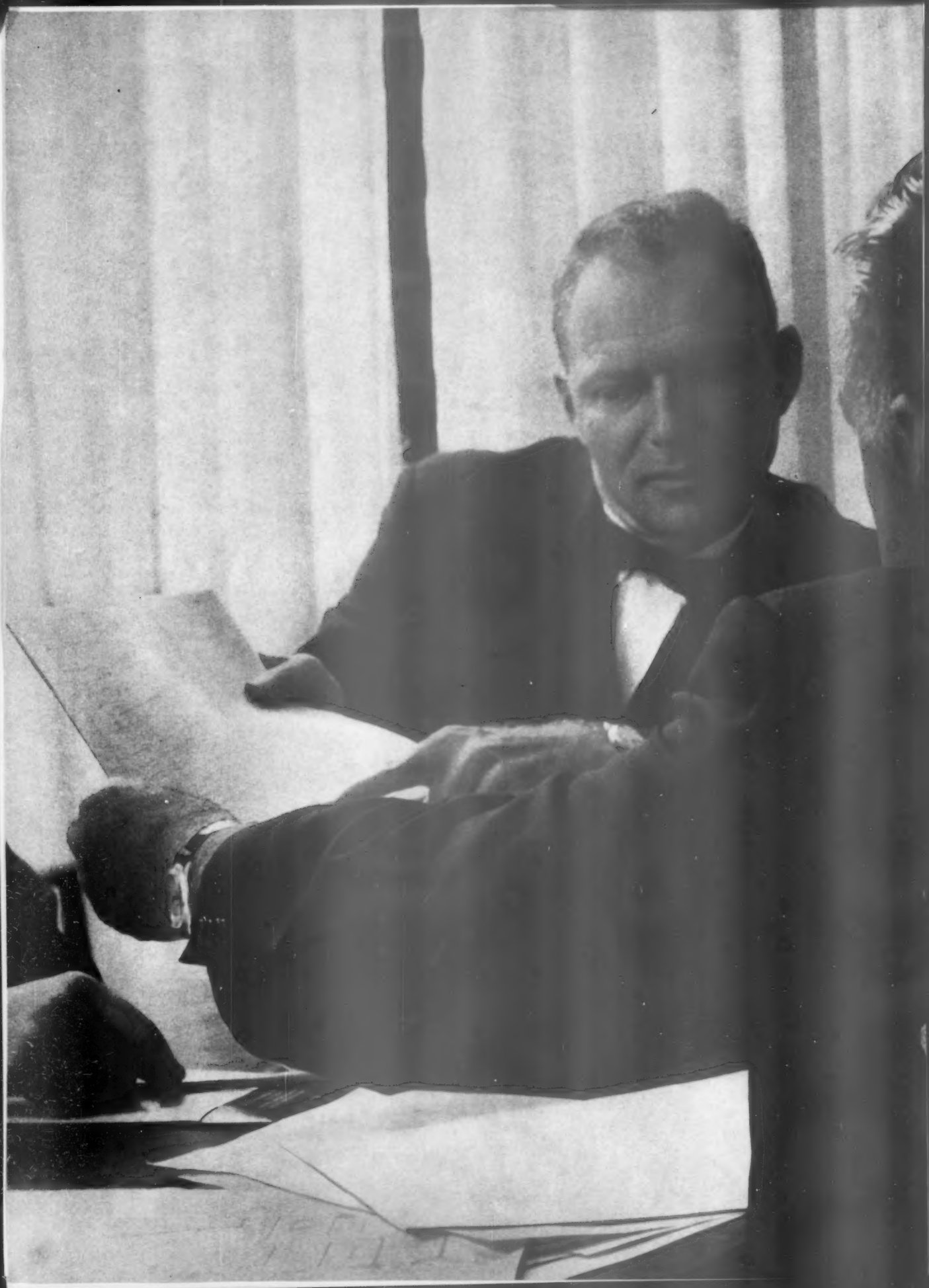

"Bob, the computer analysis says we should buy those parts instead of making them"

NEW CAPITAL INVESTMENT PROGRAM

Here's a new IBM computer program that's yours for the asking. Using the Investors Method (Rate of Return on Investment), it helps you evaluate—*quickly, economically, uniformly*—alternate proposals for spending your company's money.

The program will help you solve problems like these: should you buy a new piece of equipment or keep the old one in repair; should you increase your manufacturing facilities; should you buy or make certain products; how should you spend your money for research to make the most profit?

These are only a few of the problems that the Capital Investment Program handles. All it takes is the Program and an IBM computer that accepts FORTRAN programming language. The low cost IBM 1620 Data Processing System is one such computer.

The new Capital Investment Program is another of the many problem solving programs IBM offers you to help make your data processing system a more effective and more profitable tool for managing your business.

Your local IBM Representative can give you complete details on this, as well as previously announced programs, which included Sales Forecasting, Materials Planning, Inventory Management, Plant Scheduling, Work Dispatching, Operations Evaluation, Inventory Management Simulation, and many others.

IBM®
DATA PROCESSING

New fuel additives

Two new organic, nonmineral compounds which have entered the fuel-additives field and are now being marketed are GS-1000 gasoline supplement and DFS-1000 diesel-fuel supplement. The compounds have been subjected to road testing.

According to the manufacturer, reports indicate up to 20% increases in mileage, as well as high all-around engine efficiency and performance. The fuel supplements increase combustion by reducing the particle size of gums, resins, and polymers in all fuels to less than ¼-μ size. Source: **Fuels Research Service Co.,** 1622 Arapahoe St., Denver 2, Colo.

●

New dispersant for oil wells

Such residual hydrocarbons as asphaltenes, bitumens, and paraffins can be removed from oil wells with a new dispersant, tradenamed Parid, the maker says. Available in both liquid and solid-stick form, the product is not a solvent and does not function as one. Instead, it functions with a wetting and detergent action, in which its effectiveness depends upon the presence of free water in the system treated.

If not present normally, water can be added to the system at the time of treatment. Source: **Tretolite Co.,** 369 Marshall Ave., St. Louis 19, Mo.

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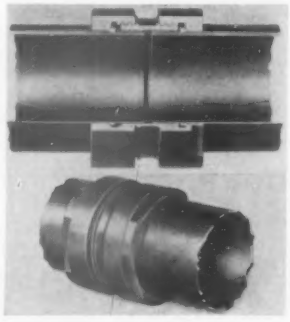

New pipe and tube coupling

Pipe and tubing can be connected easily with a new coupling which has been brought out for either metal or plastic pipe in sizes from ½ to 6 in.

Features cited for the new coupling include straight-through unrestricted flow and simple installation. The coupling is actually a union and consists of a cylindrical connector piece into which the pipe fits. Nuts which turn on Acme external threads on the connector piece draw the pipe ends against a gasket. Only the gasket contacts the flowing fluid. Source: **Cooper Alloy Corp.,** 100 Bloy, Hillside, N. J.

●

Latest gas valve

A new valve, a member of the V-38700 series, meets the challenge of high flow under pressures beyond 3,000 psi., according to the manufacturer. The main poppet seal is a resilient Teflon ring. When the valve is opened, a pressure differential is created that actually forces the seat out of the path of foreign particles in the gas stream.

When the valve is closed, the Teflon is prevented from cold-flowing by an overlapping metal seat. The O-ring seals are designed to shrink tighter as the temperature decreases. Source: **Valcor Engineering Corp.,** 365 Carnegie Ave., Kenilworth, N. J.

Target ECONOMY • SERVICE • SAFETY

There's no danger of over-buying when you specify W. C. Norris Well Head Equipment, for the Norris line is a complete line . . . with a wide range of tubing and casing heads engineered to meet your actual needs. Norris heads offer you high selectivity . . . true economy . . . without sacrificing design, service or safety. You can buy with confidence when you buy Norris. Write for prices and complete literature today!

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DOVER CORPORATION
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BRANCHES: Great Bend, Houston, Kilgore, Odessa, Wichita Falls, Salem, Casper, Farmington

NORRIS HINDERLITER
WELL HEAD EQUIPMENT

Fluid Loss Control Helps Boost Fracture Area Efficiently

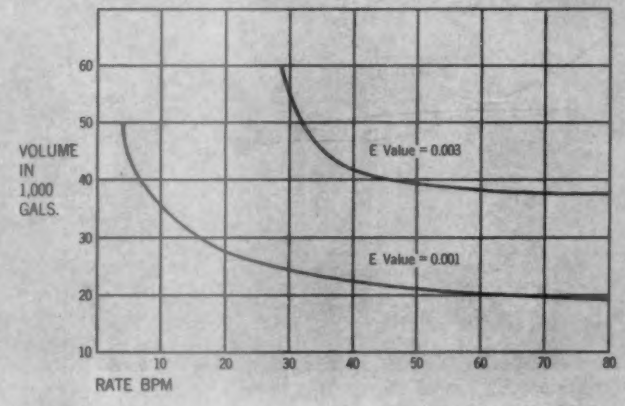
Inefficient fracturing fluids usually drain away without ever attaining the potential fracture area, or can require uneconomical volumes of fluid and horsepower to achieve it. Sandouts pose another threat when the fracturing fluid leaks off into the formation leaving propping agents behind to restrict fracture extension.

The culprit in these situations is uncontrolled *fluid loss.* Halliburton Fluid Loss Control Additives help arrest the loss of treating fluid to permeable formations by building a protective temporary barrier across the face of the fracture. When fluid loss is controlled, the main target for the fracturing fluid's work is the outer extremities of the enlarging fracture. These more efficient fluids driving under *continuous* pressure into these extremities are very important in attaining maximum fracture extension for greatest production.

Recommending the proper Fluid Loss Additive in the correct proportion is an important element of Halliburton's FRACPLAN Service — the new design for fracturing wells. Get acquainted with Halliburton Fluid Loss Additives like WAC-8, WAC-9, WLC-1, WLC-2, ALC-5, and FL-2. They could make the difference in the profitable stimulation of your well.

See your Halliburton man for the full FRACPLAN story — including all the benefits of Halliburton fluid loss control.

FRACTURE AREA – 100,000 SQUARE FEET
FRACTURE WIDTH – 0.24 INCHES



The more efficient fluid with an Efficiency Value of 0.001 will theoretically obtain the desired fracture area with an economical combination of volume and injection rate. These values, based on sound mathematics and experience, show that the less efficient fluid with an Efficiency Value of 0.003, would probably never attain the desired fracture area at most ordinarily used injection rates and volumes.

Watch your FRACPLAN at work
...ask about the FRACOMETER

FRACTURING SERVICES

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COMPANY · DUNCAN, OKLAHOMA

SIMPLIFY TREE CONSTRUCTION . . . AT LOWER COST

W-K-M Cross Type Multiple Completion Gate Valves

These compact multiple gate valves cost less than equivalent components and provide all of the service-proved features of regular W-K-M ®Gate Valves such as non-lubricated operation, Tefion* seat inserts for double-tight sealing, and parallel expanding gates for a positive up and downstream seal.

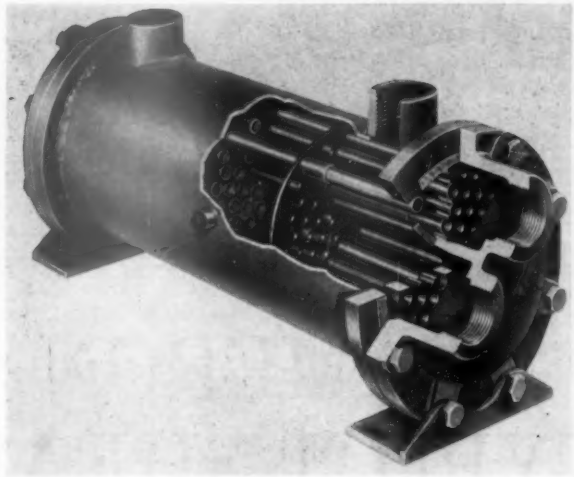
W-K-M Cross Type Gate Valves are available for dual, triple and quadruple completions. Specify W-K-M — at leading supply stores everywhere. Write for Catalog 200. W-K-M Division of ACF Industries, Inc. P. O. Box 2117, Houston, Texas.

*DuPont's tetrafluorethylene resin

When So Much Depends on a Valve . . . Specify W-K-M.

W-K-M DIVISION

ACF INDUSTRIES



Advances cited in heat exchanger

DESIGNATED as Type 500, the compact heat exchanger is available with shell diameters from 3¼ through 8¼ in., and in lengths from 1 ft., 4¾ through 6 ft., 7 in. The maker reports that use of ferrous materials for shells, connections, and bonnets forms an exceptionally strong and durable structure that withstands pressure surges and corrosive action of synthetic oils and hydraulic fluids. Elimination of hubs overcomes the problem of leakage resulting from casting porosity and improper soldering or brazing. Source: **Basco, Inc.,** 345 Payne Ave., North Tonawanda, N. Y.

Self-priming liquid pump

CALLED the Prime-Line, the pump has been specifically designed, engineered, and tested to provide a complete series of pumps for handling petroleum in bulk-storage plants. It features the beneficial characteristics of prime or reprime with air or vapor conditions.

Consisting of 11 different models with suction sizes from 3 to 6 in., the units are powered by either long or close-coupled electric motors and have capacities ranging from 100 to more than 1,200 gal. of liquid per minute. A typical example of the Prime-Line is the Model 47HEL-17B, shown in the photo above.

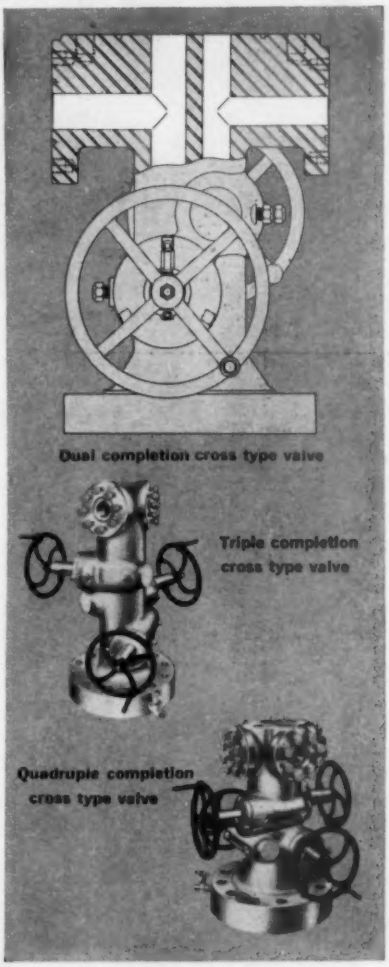
This pump will prime in only 55 seconds against a static discharge head of 29 ft. with a positive suction head of 4 through 20 ft. of dry 4-in. suction hose. The rate of flow is 410 g.p.m. at a total head of 70 ft. Source: **Marlow Pumps Div., Bell & Gossett Co.,** Box 200, Midland Park, N. J.

W-K-M

Multiple-Completion Valves

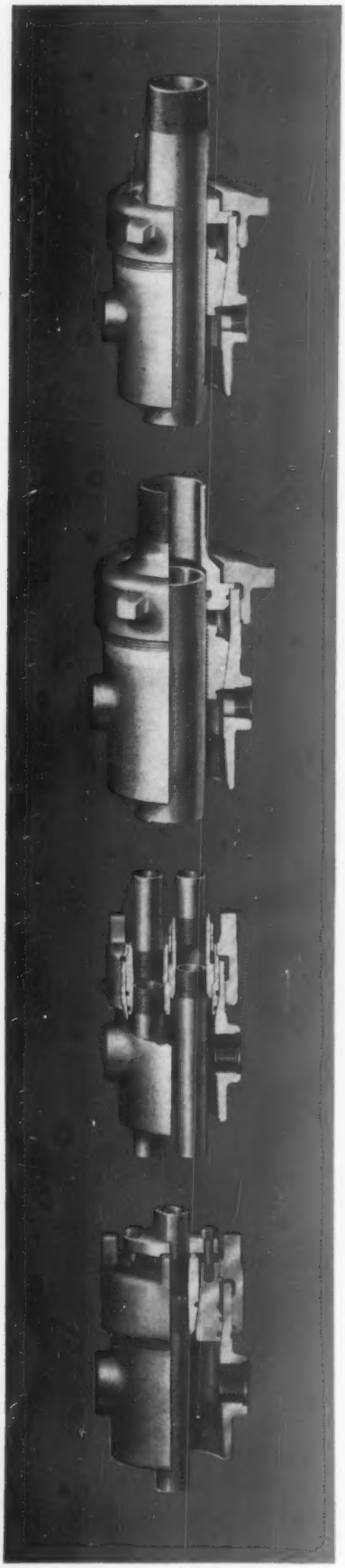
W-K-M Multiple-Completion Valves are built with Teflon seat inserts for dead-tight sealing, pressure-seal bonnets, superfinished stems equipped with roller bearings, and sealing surfaces protected from the flow.

Sizes: 1¾" and 2"
Working pressures: 2000, 3000, and 5000 lbs.



W-K-M DIVISION

ACF INDUSTRIES



Versatility--Quality--Economy

CAMERON TYPE "L" HEADS

Versatility

- All equipment is for zero to 2000 psi working pressure.
- The same housing, within size limitations, supports conventional casing, one or more tubingless casing strings or one to three tubing strings.
- Slip or mandrel suspension is optional and changing the position of a snap ring on the hanger bowl permits the use of a stripper.
- Side outlets are 2″ to 3″, threaded.

Quality

- Heads are forged steel for uniformity and strength.
- Engineering and quality control are the same as on Cameron equipment for maximum pressures.

Economy

- Functional design eliminates extra weight. (Adapter flanges may be used temporarily while drilling.)
- Engineered design with a small number of parts permits manufacturing economies.
- Unified design permits changes in type of hook-up at minimum expense.

Now you can afford the best.

Cameron

CAMERON IRON WORKS, INC.
P. O. BOX 1212 HOUSTON, TEXAS

Valve for 1,600° F.

Petrochemical-plant designers may find a new valve designed to operate at temperatures to 1,600° F. an answer to some piping problems. The valve is available in both a solid-body angle and a globe pattern. Features include bellows seals, auxiliary stuffing box, and vent connection.

The valve comes in all ASA ratings and sizes. Several hard-face seat and plug materials are available. Sphere or knife-edge seating is used to prevent leakage. Source: **Security Valve Co.,** 909 El Centro, S. Pasadena, Calif.

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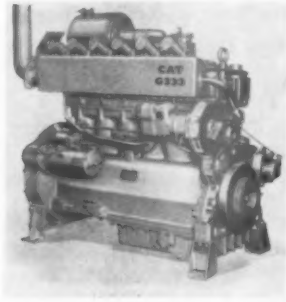


Natural-gas engine

This 130-hp. Model G333 engine should prove valuable in gas-gathering and pumping operations. The maker claims that it will give up to 25,000 hours of operation before first overhaul. It also permits taking rated power from the engine on a continuous basis, derating only for altitude and temperature.

A naturally aspirated, 6-cylinder, inline type with a 4.5-in. bore by 5.5-in. stroke, the engine develops 130 hp. at 2,000 r.p.m. It features a low-tension ignition system as standard equipment and is offered with either a 12:1 or an 8.5:1 compression ratio. Source: **Engine Div., Caterpillar Tractor Co.,** Peoria, Ill.

●

Centrifugal pump

A fractional horsepower single-stage, single suction pump, the Model C-15, Type RHK, is available for handling clear noncorrosive liquids at temperatures up to 180° F. It is available in capacities to 48 g.p.m. with heads to 100 ft.

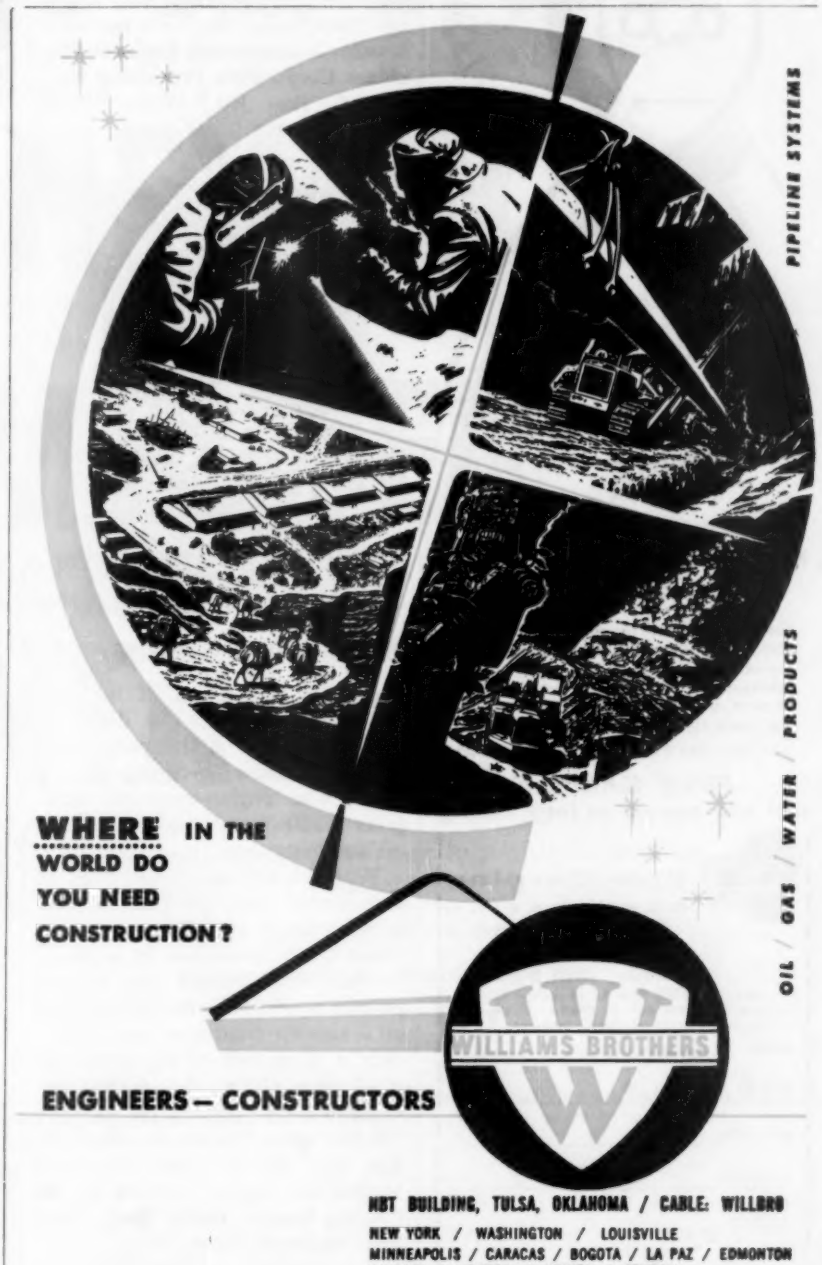
The cast iron pump has an enclosed Delrin impeller and screwed connections. To achieve compact construction and low weight, the designer has mounted the pump parts on the motor and used the motor end housing as the pump stuffing-box cover.

The pump can be installed horizontally or vertically by bolting the motor feet to a support. The casings have center-line discharge, are self-venting, and can be rotated to any of four positions. Horsepower ratings of the motor range from ⅓ to 1 hp. in both single and three-phase construction at 3,450 r.p.m. Source: **Allis-Chalmers Mfg. Co.,** 864 S. 70th, Milwaukee 1, Wis.

●

Loop closed in control system

A fast, powerful control system—capable of governing industrial processes without human intervention—has just been put on the market. The Model 1710 system was originally introduced several months ago as an open-loop system. When used in this manner, the solid-state model scans instru-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WHERE IN THE WORLD DO YOU NEED CONSTRUCTION?
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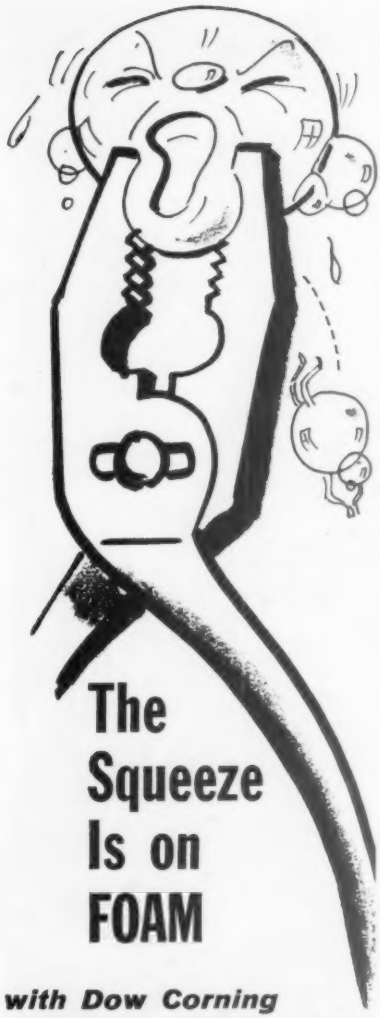


The Squeeze Is on FOAM

with Dow Corning Silicone Defoamers*

There's a *right* tool for every job. In foam control it's Dow Corning silicone antifoamers or defoamers . . . job-proved thousands of times over as the most efficient, most economical, and most versatile foam suppressors available.

* At prescribed levels, are sanctioned by FDA

FREE SAMPLE
and new manual on foam control

first in silicones

Dow Corning
CORPORATION
MIDLAND, MICHIGAN
Dept. 8823

Please rush a FREE SAMPLE of a Dow Corning silicone defoamer for my product or process, which is (indicate if food, aqueous, oil or other): _____

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

_____

ments, feeds the data into a computer, and then prints instructions telling an operator what action to take in controlling a process.

Now the loop has been closed by using a multiplexer, terminal unit, and data converter. The system no longer requires intervention by an operator to regulate a process. The adjustment of instrument settings can be made fully automatic. The multiplexer serves as the connecting link between process instruments and the control system. The data converter — especially designed to work with the multiplexer—converts instrument signals into language understood by computers. Source: **International Business Machines Corp., Data Processing Div.,** 112 E. Post Rd., White Plains, N. Y.

Oil-condition indicator

Prompt recognition of lubricating-oil contamination in diesel or gasoline engines is the prime mission of this new oil-condition indicator. The engine-mounted meter gives readings on condition of the oil automatically.

With the new dial zones, even an experienced man checking the dipstick oil levels can at the same time check the oil condition by a glance at the meter. When the black pointer is at 100% on the dial, the oil is safe for continuing use. Whenever it is in one of the zones instead of at 100%, the specific recommendations printed on the face tell him what this means—fuel getting into the oil, filter change needed for engine, or time for oil change. Source: **Gerin Corp.,** Neptune Highway, Avon, N. J.

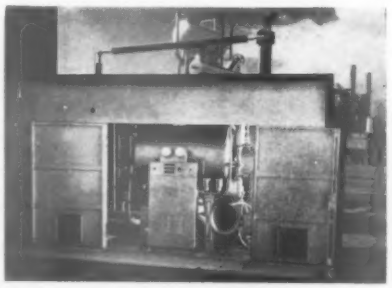
(Continued on Page 231)

Eliminate Station

Freeze-Up

Cut Construction

COSTS



Specify

TEXSTEAM

unattended
Steam Generators
with Dowtherm®209

Transwestern Pipeline Co. has installed seven Texsteam steam generating units OUTDOORS in areas subject to subfreezing temperatures without fear of compressor station freeze-up.

These unattended Texsteam Coil-N-Shell steam generators will heat the stations and warm engine fuel through the use of a heat-transfer medium . . . Dowtherm®209. Dowtherm forms an azeotropic mixture with water and protects against freezing.

Now, you can install steam generating equipment outdoors in cold areas, eliminate insulation, save construction costs on a utility room. And your Texsteam steam generator is self-contained . . . needs only concrete supports for installation.

If you have a station heating problem, consult Texsteam. For complete information on Texsteam Coil-N-Shell steam generators, write for new sales bulletin.

TXT TEXSTEAM
A SUBSIDIARY OF [illegible] HEATING CORPORATION
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Houston 11, Texas • Phone WA 8-5361

6105

HOW TO SAVE

You can also gain greater speed and far greater flexibility from a major advance in control computers.

MONEY ON

Stored Logic provides these benefits, and the TRW-530 is the first control computer with Stored Logic.

COMPUTER

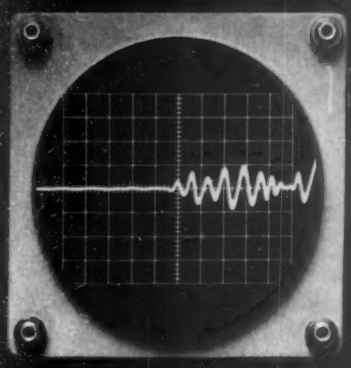
Stored Logic in the TRW-530 gives you economy in programming, economy in operating time, economy in memory requirements.

CONTROL

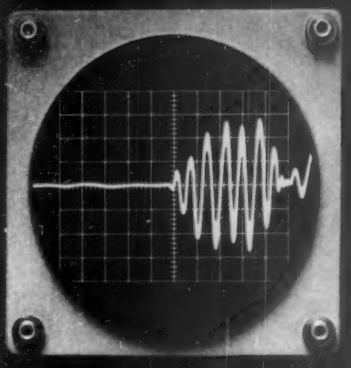
How can Stored Logic work for you? Our engineers will tell you why Stored Logic in the TRW-530 is the money-saving answer to problems such as multiple-unit control in a large process plant. Contact one of our offices below.

TRW Computers Company
a division of
Thompson Ramo Wooldridge Inc.

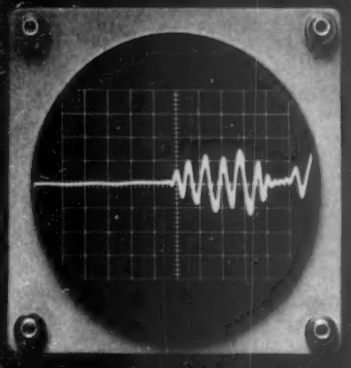
LOS ANGELES 8433 FALLBROOK AVENUE, DIAMOND 6-6000, EXT. 2227 • **CHICAGO** 200 SOUTH MICHIGAN AVENUE, HARRISON 7-6348 • **HOUSTON** 1510 ESPERSON BUILDING, CAPITAL 7-5319 • **NEW YORK** 200 EAST 42ND STREET, MURRAY HILL 2-8488



INTERVAL A — Heavily-fractured formation results in very low formation signal amplitude.



INTERVAL B — Unfractured formation results in normal signal amplitude.



INTERVAL C — Partially - fractured formation results in lower-than-normal formation signal amplitude.

WELEX FIRST AGAIN!

New Frac Finder locates best completion interval

The three intervals at left show different degrees of natural fracturing in the same limestone structure. Is there any question which interval you would select for completion?

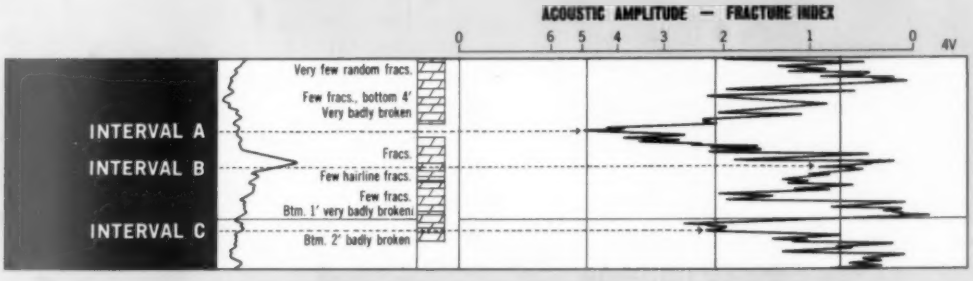
The heavily-fractured interval promises to be a star performer even though the matrix porosity and permeability may be low. But the non-fractured interval, though it's on structure, may not even make a well. This means that an accurate method is essential for determining if the fractures are open. So the only question is—**How do you find the most heavily fractured interval?**

The Welex Fracture Finder, with a direct-reading Fracture Index printed right on the log, does it simply with a single curve. The Fracture Finder (or Acoustic Amplitude Log) directly measures the formation signal amplitude, accurately locating all open natural fractures within perforating range of the well bore.

The Fracture Index is based on engineering data obtained by Welex in a full-size test pit containing natural limestone blocks. It gives an easily read quantitative measure of the degree of fracturing in each zone.

In the past, cycle skipping on acoustic velocity logs sometimes has been used in an attempt to find fractures. The Welex Fracture Finder, with its Fracture Index, makes this "trial and error" method of fracture location obsolete.

The Fracture Finder shows both vertical and horizontal fractures and gives you a complete picture on the first trip



—showing plainly where the fractures are and **the degree of fracturing.**

In fractured formations the Fracture Finder measures the reduction in the amplitude of the acoustic signal caused by reflections of energy at any interface where there is a large density change. At such interfaces a portion of the signal is reflected and a lesser amount reaches the receiver than if the fractures were not present.

On your next well, call Welex. The Welex Fracture Finder Acoustic Amplitude Log is fully tested, field proved and ready to work for you.

COMPLETE WIRELINE Welex SERVICES

WELEX

A Division of Halliburton Company

General Offices: 1728 Old Spanish Trail, Houston, Texas

It's FIRST with me...

I like personal attention

The most important person at the First City National Bank is *you*. Everything in our new bank was designed to prove it.

Look—no doors . . . no gates . . . no "don't-enter-without-an-appointment" private offices.

Instead—a beautiful, open banking room where every officer is within hand-shaking distance. Where interested, personal attention makes you feel welcome.

Drop in and see for yourself how pleasant it is to bank in the friendly, informal atmosphere of First City National Bank. It takes only a minute to open an account. Why not join the "First family" of Houston this week. We'll be expecting you.

the new

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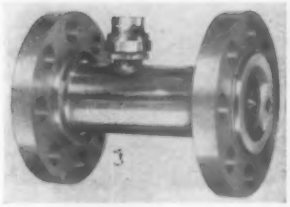


Turbine flowmeters

A new series of turbine flowmeters for totalizing, recording, blending, telemetering, and measurement applications has been announced. Available in 12 sizes for flows from 5 to 12,000 g.p.m. with linearity of 0.05% of flow, the flowmeters are fabricated of stainless steel with standard ASA or split-ring flanges. The electrical pickup terminates in a conduit fitting to permit installation in hazardous and exposed areas.

The meters operate at pressures up to 3,000 psi. and at temperatures from −455° to 500° F. with pressure drop of about 4 psi. By removal of one retaining ring, the entire flow straightener and turbine assembly can be removed from the meter for cleaning or inspection. Source: **Cox Instruments Div., George L. Nankervis Co.,** 15300 Fullerton, Detroit 27, Mich.

•

Water-level safety switch

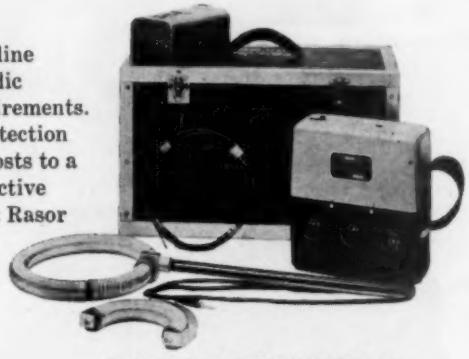
Designated Type L-150, this water-level switch gage for engines shows the level and condition of water and shuts down the engine automatically when water reaches a low level. A visible float and pointer contacts show operating condition of the switch at all times. Rated at 50 psi., the 3½ by 3½-in. safety switch is designed to be installed easily on atmospheric or pressure-cooling systems and on condenser radiator systems. Source: **Frank W. Murphy Mfr., Inc.,** 3131 S. Sheridan Rd., Tulsa, Okla.

INSPECTION IS THE KEY TO GOOD PIPE COATING

TINKER & RASOR HOLIDAY DETECTORS

insure coating continuity

Every void in your pipeline coating increases cathodic protection current requirements. To obtain maximum protection and hold maintenance costs to a minimum, inspect protective coating with a Tinker & Rasor Holiday Detector and make repairs before backfilling.



Tinker & Rasor E P Holiday Detector. Portable, "damp-climate" pulse type.

Write for your free Data Kit.

Tinker & Rasor has prepared a complete data kit of descriptive material and recommended procedures for inspecting protective coatings. Material includes technical data on equipment, recommended inspection procedures, general discussion of types of detectors, theory of operation, etc.

ENGINEERING NOTE:
To insure a perfect application, include Tinker & Rasor Holiday Inspection. Write for specification guide.

Quality Control for Coating Application

TINKER & RASOR

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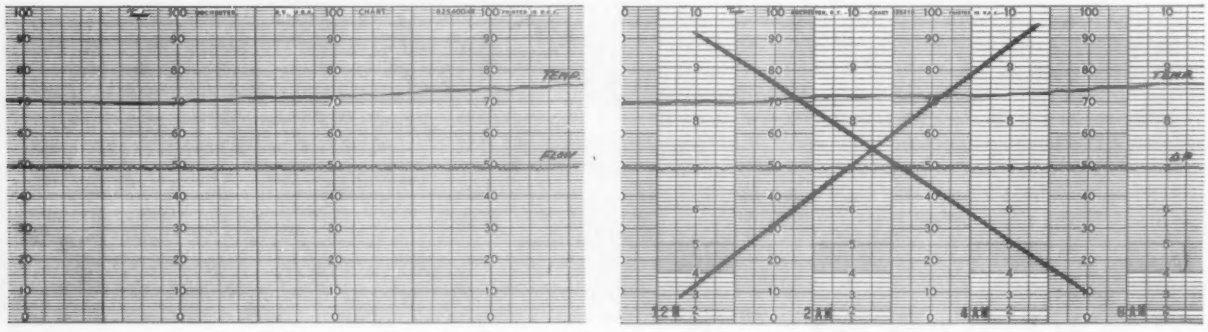
212T TRANSCOPE *Transmitter has mounting and process connection versatility. Process connections at top, back, bottom. ½" NPT fittings set on 2⅛" centers. Universal mounting bracket for 2" pipe, or bolting to flat surface.*



Calibration linear with flow *eliminates need for sectionalized charts.*

Taylor Instruments

Want a superior DP transmitter?

THE 212T TRANSCOPE® TRANSMITTER

performs better

AND . . .

gives linearized flow output without changing parts

AND . . .

with no premium price ! ! !

The Taylor 212T TRANSCOPE Transmitter is first and foremost a superior DP Transmitter. In addition, however, when used for flow it can be calibrated to give linear output without changing parts. Check these plus features that are all yours with *no premium price tag.* Then see your Taylor Field Engineer for a demonstration or write for **Bulletin 98413.** Taylor Instrument Companies, Rochester, New York, and Toronto, Ontario.

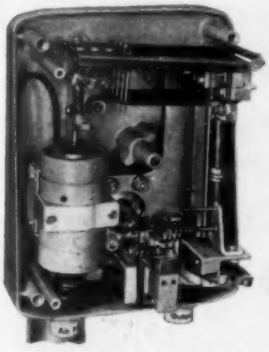
- **High Accuracy**—within ½% of output.
- **Liquid-filled primary unit means:**

  Positive overrange protection. Hydraulic overrange protection to full body rating in either direction.

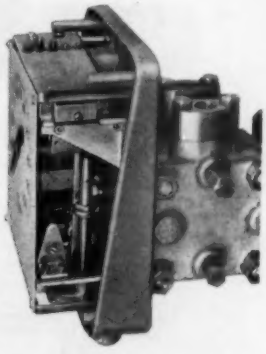
  Isolation of internal parts. Working parts—except diaphragms themselves—are exposed only to non-corrosive silicone oil.

  Built-in damping. Effective pulsation damping occurs at frequencies greater than approximately 2 cycles per second.

- **Exceptional Rangeability.** 20 to 250″ water for differential pressure, 20 to 175″ water for flow. Zero suppression and elevation available.
- **Servo power for square root extraction.** Linear output is a real money saver when applied to computer control or ratio and cascade control systems.
- **Linearized flow** eliminates need for sectionalized charts.



Open case design provides free access for maintenance.



Diagonally split case gives easy access for all adjustments.

MEAN ACCURACY FIRST

NOT A NEW VALVE!

Just a **NEW DESIGN** to keep PACIFIC out front with a complete line of Corrosion Resistant Gate, Globe Angle, Check, and Ball Valves for the process industries.

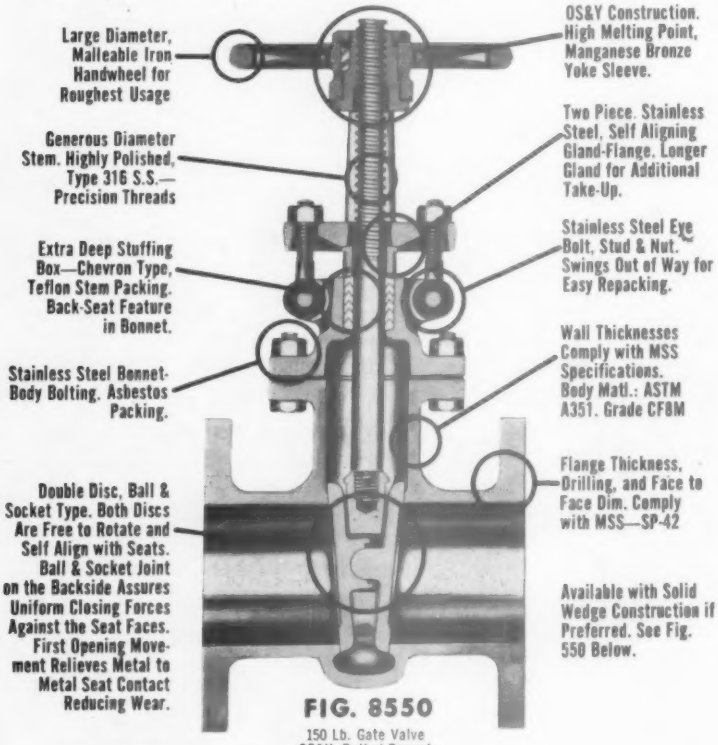

Large Diameter, Malleable Iron Handwheel for Roughest Usage
Generous Diameter Stem. Highly Polished, Type 316 S.S.—Precision Threads
Extra Deep Stuffing Box—Chevron Type, Teflon Stem Packing. Back-Seat Feature in Bonnet.
Stainless Steel Bonnet-Body Bolting. Asbestos Packing.
Double Disc, Ball & Socket Type. Both Discs Are Free to Rotate and Self Align with Seats. Ball & Socket Joint on the Backside Assures Uniform Closing Forces Against the Seat Faces. First Opening Movement Relieves Metal to Metal Seat Contact Reducing Wear.
OS&Y Construction. High Melting Point, Manganese Bronze Yoke Sleeve.
Two Piece, Stainless Steel, Self Aligning Gland-Flange. Longer Gland for Additional Take-Up.
Stainless Steel Eye Bolt, Stud & Nut. Swings Out of Way for Easy Repacking.
Wall Thicknesses Comply with MSS Specifications. Body Matl.: ASTM A351. Grade CF8M
Flange Thickness, Drilling, and Face to Face Dim. Comply with MSS—SP-42
Available with Solid Wedge Construction if Preferred. See Fig. 550 Below.

FIG. 8550
150 Lb. Gate Valve
OS&Y, Bolted Bonnet
Dble. Disc; MSS Figs.
Sizes: ½" to 14"

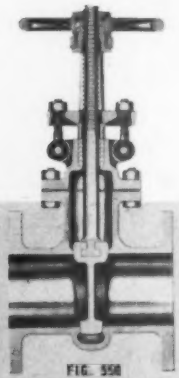


FIG. 550
150 Lb. Gate Valve
Solid Wedge; MSS Figs.
Sizes: ½" to 8"

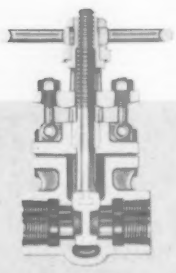


FIG. 551
150 Lb. Gate Valve
Solid Wedge; Screwed Ends

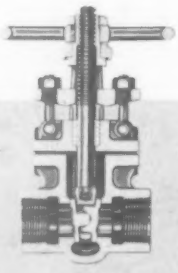


FIG. 8551
150 Lb. Gate Valve
Dble. Disc; Screwed Ends

PACIFIC VALVES, INC.
3201 Walnut Avenue, Long Beach 7, California
Telephones: Long Beach—GArfield 6-2531; L. A.—NEvada 6-9811

TRADE LITERATURE

Gas-engine-driven compressors

Subject of this 56-page publication is the Model TLA gas-engine-driven compressor series of 1,700 to 3,400 b.hp. These compressors are designed for use in pipeline, gas storage, and process applications. In addition to performance features, the bulletin describes the turbocharging system, conventional and en-bloc compressor cylinders, and various automation systems. Dimensions and specifications are included, along with construction details, sectional views, and 36 installation photos. Source: **Clark Bros. Co.,** Box 560, Olean, N. Y.

Elements of cascade control

Application Bulletin 91-53P-04, dealing with the elements of cascade control of chemical processes, presents advantages of the control, along with various systems of instruments that achieve this type of control. Jacketed kettle-temperature control and level control in a filtrate tank are cited as typical of applications in which cascade control can be beneficial. The bulletin describes functions of the cascade control system for each case, while diagramming processes. Source: **Fischer & Porter Co.,** 26 Jacksonville Rd., Warminster, Pa.

Why and How of Noise Control

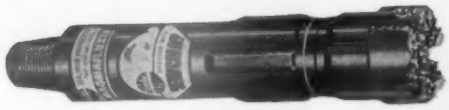
This new 16-page booklet shows how to set up a noise-control program to achieve safe and efficient working conditions. Also discussed is equipment needed to set up this kind of program. Source: **Instrument Div., H. H. Scott, Inc.,** 111 Powdermill Rd., Maynard, Mass.

Industrial-gas booklet

This pocket-sized-gas booklet, bound in leatherette, provides a compact, readily accessible form. The booklet lists physical and chemical properties of oxygen, nitrogen, argon, helium, hydrogen, carbon dioxide, acetylene, neon, krypton, and xenon. Handy conversion tables provide a simple and fast method for changing volumetric

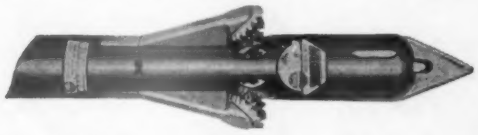
SERVCO TOOL GUIDE

8 ways to lower drilling costs



JUNK MILLS Tough, rugged tools for chewing up bit cones, packers, drill pipe, junk of all kinds—at rates that make fishing uneconomical.

SECTION MILLS Mill any length section at rates up to 4′ per hour. Often complete window cut with one set of arms. Mill all weights of casing from 5″ to 13⅜″ O.D.



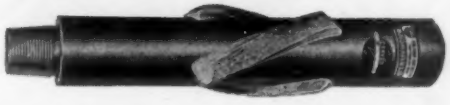
HOLE OPENERS *Rock Bit Type:* Opens hole up to twice the bit diameter in hardest formations. Also, *Blade Type* increases hole diameter up to 17″, simultaneously with drilling, in soft to medium formation.

PILOT MILLS Mill wash pipe, casing, liner, liner hanger, drill pipe or tubing at rates up to 10′ per hour; drill collars up to 2′ per hour. The perfect tool for swaged casing completions.

TAPER MILLS Mill collapsed casing, enlarge holes through adapters or retainers, mill out dented casing, and for general reaming.

ROTARY SHOES Difficult washover and milling jobs completed in a fraction of the time required by conventional shoes. Tooth type to cut formation; perforated type to cut iron and formation.

REAMER-STABILIZERS Keep hole to gauge in the roughest, sharpest sands. Save rig time and money by eliminating double drilling and separate reaming operations. SERVCOLOY "W" resists wear 5 to 10 times better than conventional hardfacing.



STABILIZERS *Welded Blade Type:* rugged, low cost tools with welded wrap-around wings. *Model "B":* Replacement wings quickly changed without removing body from string. SERVCOLOY "W" makes tools last 5 to 10 times longer than conventional hardfacing.

SERVCO tools make downhole milling and drilling safe and economical. The secret of their phenomenal performance lies in the amazing material called *Servcoloy*. Developed by SERVCO and protected by patents, and constantly improved through research and field usage, *Servcoloy* fully utilizes carbide's cutting properties while overcoming its inherent brittleness. Are you profiting from its use? Your SERVCO representative will be glad to tell you how. Call him today.

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Today, electronic answers for your cut-off

1. When is the right time to cut the right length of rope? With Union's new electronic brain calculations you don't have to guess—you **know** exactly the maximum safe service to expect. It took 462 charts and more than 600,000 calculations, but oilfield wire rope cut-off procedures now are scientifically based. Union's Tuffy has figured it all out on the IBM "705" electronic brain.

2. Union's staff of trained engineers goes to work on your problem at once. All variables are considered — drum diameters, derrick heights, drill collar and pipe sizes, rope diameters, design

How would you like to use the same magic brain that it takes to get missiles and rockets off the launching pad to solve *your* Cut-Off Procedure problems on your next drilling job? Now you *can*—and Union Wire Rope brings you this million dollar service free. We have over 600,000 electronic calculations to make ton-mile charts—charts that tell you the proper length and time to cut rope for maximum safe service for any drilling operation anywhere in the world.

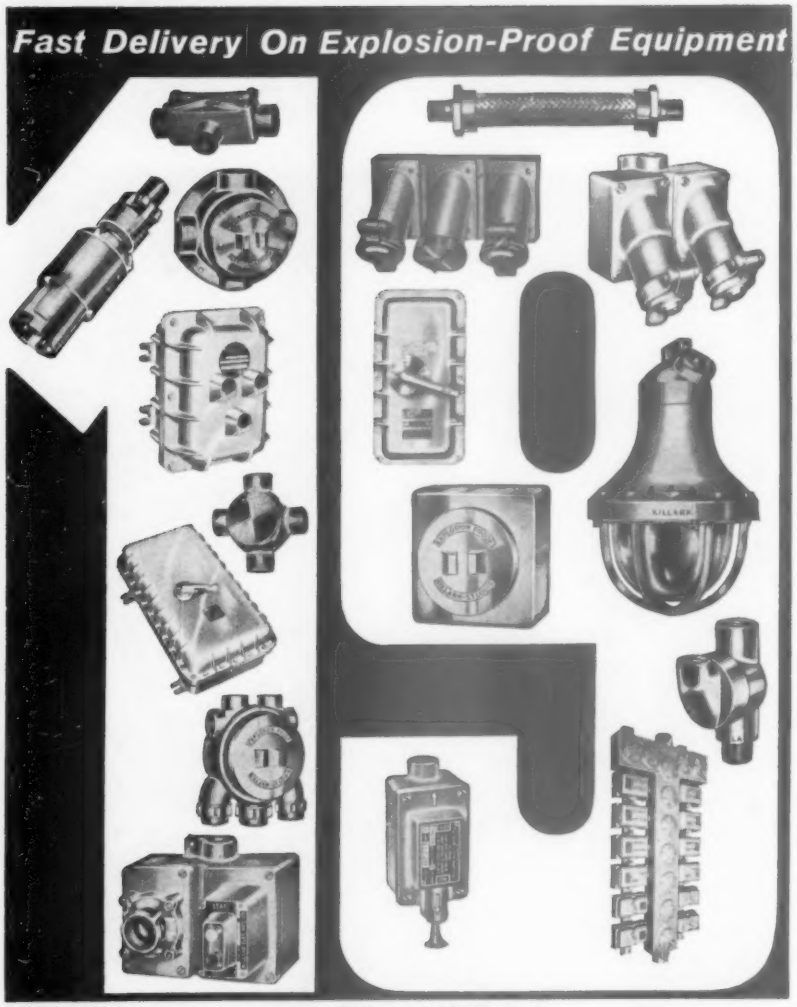
Try this new Electronic Cut-Off Procedure on your next job. And be sure you specify Union Tuffy Standard Rotary Line, Union Tuffy Jackknife Rotary Line and the Standard Union Oil Well Servicing Ropes. The best costs less on the long haul. For quick delivery, call your oil field supply store.

procedures are as quick as 1-2-3!

factors, mud or air drilling, etc. It's all charted—a total of 118,360 different answers! Our engineers select from the master book the ones that apply to **your** job. There is no guess work involved.

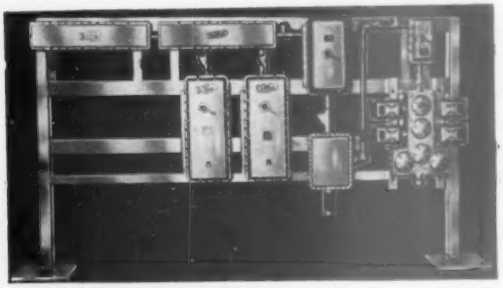
3. **The answer to your cut-off procedure problem** is rushed to you by our Union fieldman. So far as you're concerned the rest is easy. Only 5 or 6 simple charts usually is all that's required. Our fieldman will explain their use to you and your crew, all without cost. And he'll check back regularly with you to assure maximum safe service all the way. For more information and booklet on Cut-Off Procedures, contact **Union Wire Rope, Armco Steel CORPORATION, 2102 Manchester Ave., Kansas City 26, Mo.**

ARMCO **Union Wire Rope**



...nineteen convenient Killark warehouses deliver explosion-proof fittings and fixtures promptly!

Regardless of where you are located in the United States or Canada, there's a Killark warehouse nearby with a complete line of aluminum explosion-proof electrical fittings and fixtures, U.L. or C.A.S. approved. Your Killark wholesaler probably has the item you need in stock or can get it for you quickly because his stock is backed up by nearby factory warehouse stocks in nineteen locations to assure you fast delivery. Killark electrolets are made of copper-free aluminum.



CUSTOM MADE
SWITCH RACKS
ENGINEERED AND BUILT TO YOUR SPECIFICATIONS
•
ONE SUPPLIER FOR ALL COMPONENTS

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Killark
ELECTRIC MANUFACTURING CO.
Vandeventer and Easton Aves. • St. Louis 13, Mo.
In Canada: Killark Electric of Canada, Ltd., 421 Islington Ave., South Toronto, Ontario

information on the various industrial gases from one equivalent unit of measure to another. Liberally illustrated with charts and diagrams, the booklet also provides capacity data on industrial gas delivery and storage systems. Source: **Air Reduction Sales Co.,** 150 E. 42nd St., New York 17, N. Y.

Full-revolving electric cranes

Bulletin 540 describes several crane models, ranging in capacities from 150 to 16,250 ft. tons. In addition, it points out many advantages to be ganied through their application. Other items in the 12-page bulletin include brief specifications on each unit, as well as electrical, mechanical, and structural features. Photographs of electric motors, gear reductions, generators, and switch gear show compactness and design simplicity used in the cranes. Source: **R. G. LeTourneau, Inc.,** 2399 S. MacArthur, Longview, Tex.

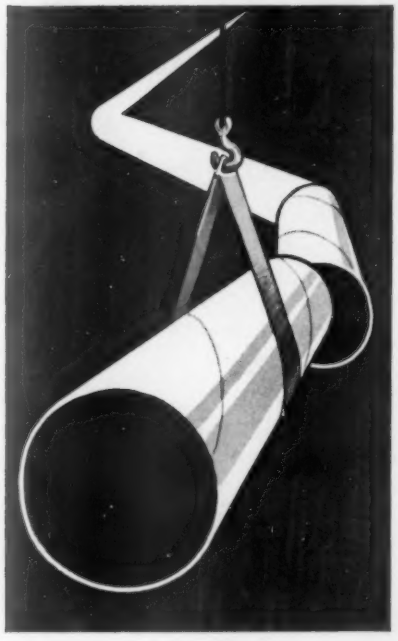
Booklet presents LACT units

This new publication on lease automatic-custody transfer units, illustrated with photographs and diagrams, is now available to interested persons. The booklet details operation of the units, and offers additional data on features, specifications, conventional and optional components, and installation. Source: **Jones & Laughlin Supply Div.,** P. O. Drawer 2481, Tulsa 2, Okla.

Cathodic-protection power supplies

Just released is this 44-page catalog covering both conventional and custom-engineered power supplies, ranging in size from 50 watts to 5,000 kw. Among the more than 3,000 models listed and described is the Type CP series of supplies, tailored for applications in corrosion control. Uses are seen in submerged gas-well casing, storage tanks, drilling rigs, and pipelines. The catalog was designed to allow the nontechnical man to find what he needs in a matter of seconds, and to give technical data to the engineer. Source: **American Rectifier Corp.,** 95 Lafayette St., New York 12, N. Y.

ARMCO THIN-WALL LINE PIPE IS BACKED BY 27 YEARS' EXPERIENCE



For strength, economy, durability

Armco customers have been using thin-wall line pipe—and saving money—for years. Armco pioneered this development more than 27 years ago and has supplied the oil and gas industry with "thin-skinned" line pipe ever since.

Improved coating and cathodic protection methods eliminate the need for any corrosion allowance in the pipe wall and make it possible for you to select only the wall thickness necessary for your specific application. Armco makes this selection an easy one (and reduces your original line pipe cost) by providing the widest range of diameter-wall thickness combinations. You buy only the steel you need—no extra.

Let Armco's experience in supplying thin-wall pipe work for **you**. Mail the attached coupon, outlining your pressure requirements, and an Armco Sales Engineer will contact you promptly. Write to **Armco Drainage & Metal Products, Inc., subsidiary of Armco Steel Corporation, 202 KOME Building, Tulsa, Oklahoma.**

I want more information about Armco Line Pipe.

My requirement is_____

NAME_____

COMPANY_____

STREET_____

CITY_____ STATE_____

ARMCO Drainage & Metal Products

EQUIPMENT MEN

John W. Collins assumes duties as president of Walworth Co.

Collins will also continue as president of Walworth's Oakland, Calif. subsidiary, Grove Valve & Regulator Co. He will be headquartered at Walworth's offices in New York City. During 18 years with Grove, Collins was treasurer, senior vice president, and president.

Cooling Products, Inc. established in Tulsa

Cooling Products, Inc., recently set up at 1402 E. Haskell, in Tulsa, is engaged in the manufacture of atmospheric - type cooling sections used in conjunction with water-cooling towers. Principals are George M. Certain, president; R. Murray Carr, vice president; and James I. Carter, secretary and treasurer.

Certain and Carter were formerly with the Aimco Products Division of Yuba Consolidated Industries. Certain was production manager and Carter served as general manager of the division. Carr is president of Air-x-changers, Inc., of Tulsa.

Independent Acid, Inc. formed to provide acidizing services

Jack R. Jones and George Hoisington announce the establishment of a new company—Independent Acid, Inc.—with headquarters in Great Bend, Kans. The company will specialize in oil-field acidizing and chemical services. Jones is a consulting petroleum engineer in Great Bend, and is owner of Jetmar Well Services. Hoisington was previously engaged in chemical services with Halliburton Co. for 19 years.

Texsteam Corp. joins PESA

Texsteam Corp., of Houston, has joined the Petroleum Equipment Suppliers Association, it was announced by H. R. Safford, Jr., executive vice president of the association. The membership of PESA is made up of some 150 firms engaged in various phases of the petroleum - equipment manufacturing, supply, and service industries. Nation-wide in scope, the association is headed this year by W. H. Larkin, president of Larkin Packer Co., a division of Koehring Co.

Wolverine Tube announces three marketing-organization changes

E. J. Campbell

Involved in this move are the sales managers of Wolverine's Chicago, Cleveland, and Detroit sales districts. E. J. Campbell, sales manager of the Detroit district, will become manager of the Chicago district. A member of the organization's marketing division since 1943, Campbell has served in various capacities in Detroit, Grand Rapids, and Chicago. He was midwestern district sales manager for 7 years.

R. C. Cash

R. C. Crowe

R. C. Cash, manager of the Chicago district, has been appointed to the newly created post of market research manager, Research & Development Division. Cash joined Wolverine as a sales representative in 1951, serving in Memphis and Birmingham. He became Birmingham district sales manager in 1959. Cash now will headquarter at the Allen Park, Mich. offices.

R. C. Crowe, manager of the Cleveland district, will become manager of the Detroit and Cleveland districts, now combined. Crowe joined the company in 1950 in an industrial and public relations capacity and subsequently served as a sales representative and manager of product sales. He will be located at Wolverine's Detroit district sales office.

Jones & Laughlin Steel Corp. makes two executive changes

Two changes in Jones & Laughlin's Steel Warehouse Division have been announced by George L. Stewart, division president. Norbert E. Willkomm has been named to the newly created position of manager—tubular sales. He was formerly assistant manager of the division's Cleveland Steel Service Center. Charles O. Kelly has joined J&L as manager of sales, Cleveland Steel Service Center. He was previously employed by Chase Brass & Copper Co., Cleveland.

Schlumberger Well Surveying makes three reassignments

G. F. Horst, senior sales engineer for Schlumberger at Hobbs, N. M., has been shifted to the Permian basin division at Midland, Tex. D. H. Raymond, field engineer general at Hebbronville, Tex., has been promoted to manager of that location. A. H. Jaegler, senior sales engineer at Hobbs, has been transferred to Schlumberger's Tyler, Tex. location.

Pressure Services, Inc. names Johnny Wall to service-mgr. post

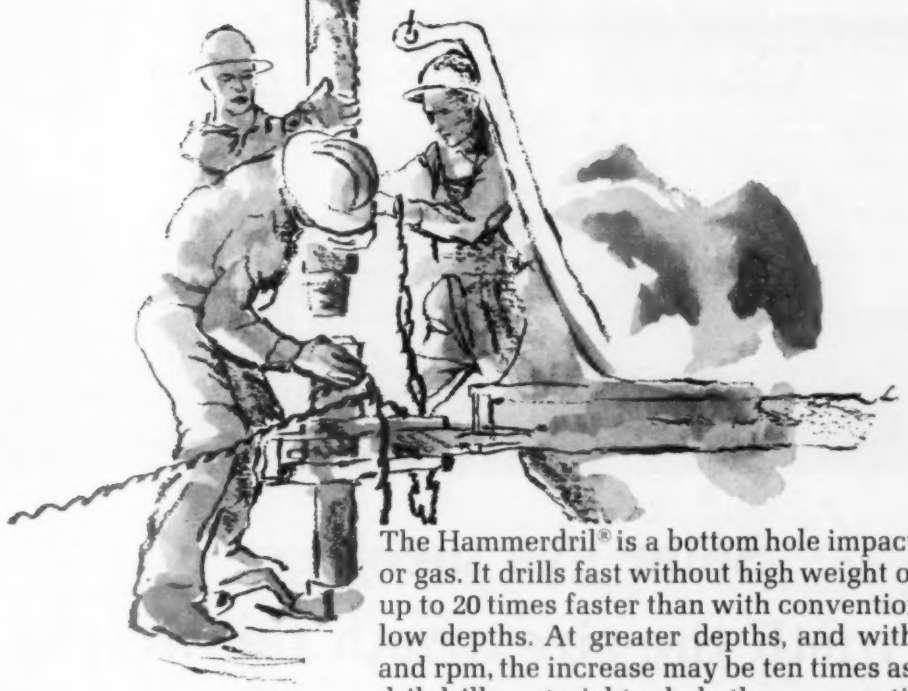
In this position, Wall will be in charge of all company pipe snubbing operations. Previously he had 11 - years experience in snubbing operations and meeting well problems created by subsurface pressure. Pressure Services, Inc., of Dallas, produces wire-line-operated-control equipment and provides services for running and pulling pipe under pressure.

Bethlehem Supply Div. transfers T. C. Graham to Shreveport

J. V. Spalding, general sales manager of Bethlehem Steel Co.'s Supply Division, announces the transfer of T. C. Graham from Calgary, Alta. to Shreveport. Graham will serve as assistant to the regional manager, H. V. Harder, who is lo-

HAMMERDRIL PERCUSSION POWER

on your air/gas rotary rig drills more hole faster with fewer bits even in crooked hole country

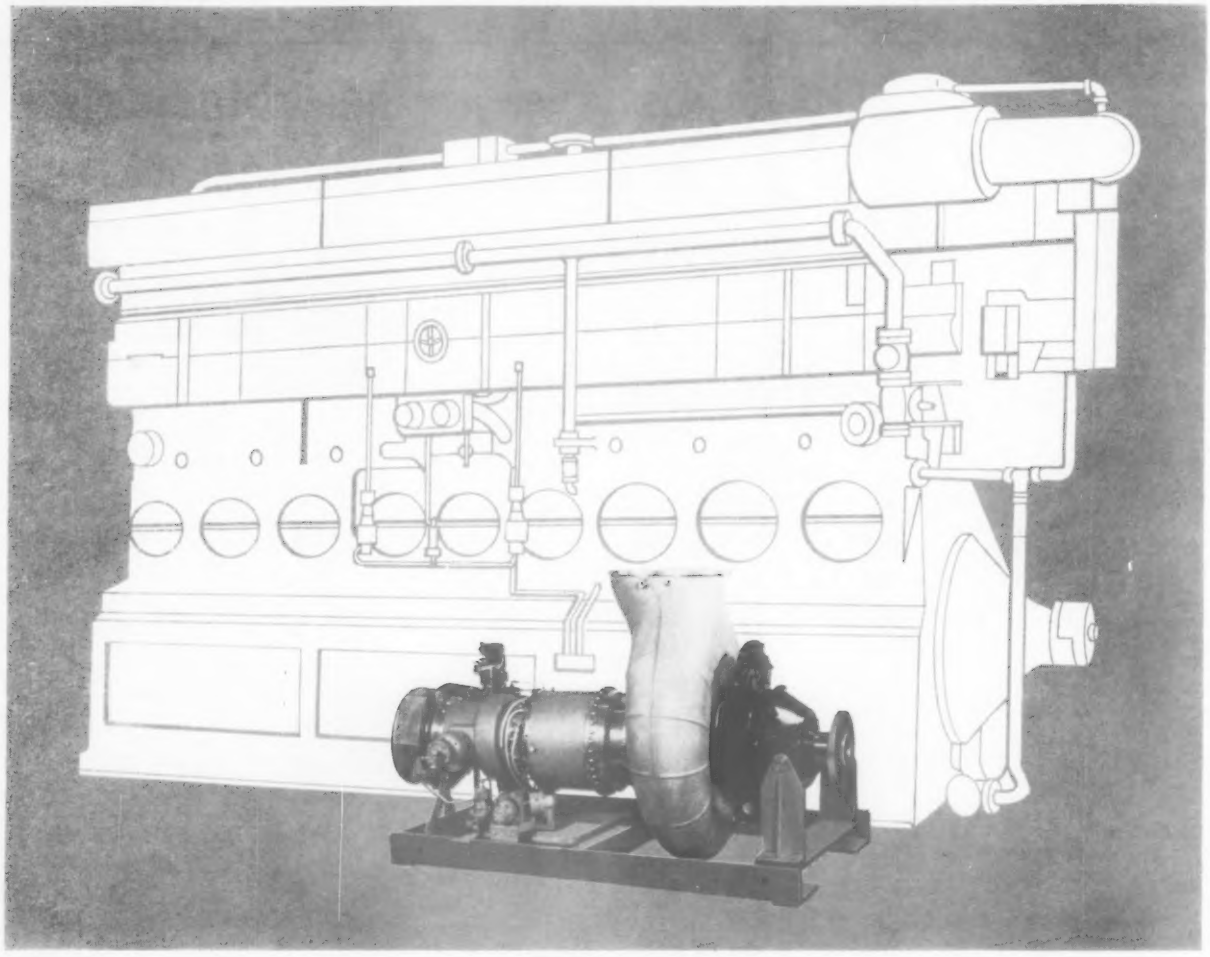


no money to invest you lease the series 350 Hammerdril

The Hammerdril® is a bottom hole impact tool that runs on air or gas. It drills fast without high weight on bit; so you can drill up to 20 times faster than with conventional air rotary in shallow depths. At greater depths, and with comparable weight and rpm, the increase may be ten times as great. The Hammerdril drills a straighter hole than conventional air rotary at the same penetration rate, or it makes hole faster at the same deviation angle as conventional air drilling. The Hammerdril greatly increases the hole footage obtained from bits. Generally speaking, you can use tooth type bits in most formations, even though carbide inserts were needed with conventional air drilling. The Hammerdril can operate successfully with volumes of water as great as can conventional air drilling. You can start now to cut your drilling costs with the Series 350 Hammerdril. You don't buy it. You lease it from Mission, and we show you how to use it,right on the well.

MISSION MANUFACTURING CO. HAMMERDRIL

P. O. BOX 4209 · HOUSTON, TEXAS / OVER THIRTY YEARS OF DRILLING RESEARCH



Solar gas turbines are 1/10th the size, 1/20th the weight of diesel engines of comparable hp

This picture shows the amazing difference in size and weight between Solar's *Saturn* 1100 hp industrial gas turbine and a conventional industrial diesel. The *Saturn* gas turbine is ⅛oth the size of a conventional engine and weighs 1/20th as much as the lightest industrial slow speed diesel of similar horsepower. Some diesel engines in the 1000–1200 horsepower range weigh as much as 106,000 lbs—more than 85 times heavier than the *Saturn* engine's 1200 lbs.

But the *Saturn* gas turbine is no lightweight when it comes to durability and long life. Each part has been engineered to give economical, long life service. *Saturn* gas turbine engines are being used in continuous duty applications in extreme climates. They provide power for 800 kw generator sets, natural gas pipeline pumping and compression stations, oil well fracturing and flooding operations and many other jobs.

Like all Solar industrial gas turbines, the *Saturn* engine starts instantly and accepts full loads in any climate without warmup, even after months of standby service. There is no vibration; simple design with few moving parts assures easy maintenance. Any kind of liquid or gaseous fuel can be used. Light weight and small size pay their biggest dividends in low installation costs. Expensive heavy foundations and buildings are unnecessary. The *Saturn* engine occupies 51 cu ft of space and can be mounted on a skid or on the back of a truck.

Solar gas turbine engines range from 50 to 1100 hp. For further information; write Dept. J-172, Solar, San Diego 12, California.

SOLAR
A Subsidiary of International Harvester Company

cated in Dallas. In his new job, Graham will be in charge of Magnolia, Ark., Shreveport, and Many, La., and Kilgore, Tex. operations.

Graham has been with Bethlehem Supply 21 years; the last two spent in Calgary and the seven before as district manager in Corpus Christi.

Clint A. Redd assumes new post at Grove Valve & Regulator Co.

C. A. Redd

Redd's appointment to product manager—valves, was announced by George E. Doty, vice president and general sales manager of the Oakland firm. Redd will supervise sales of Grove's full line of valves to the oil and gas industry throughout the United States. Prior to this appointment, Redd held a number of executive sales positions with W-K-M Division of ACF Industries, in Houston. His most recent post with W-K-M was as supervisor of pricing for valve products.

Robt. J. Young elected prexy of Hill Hubbell; Bowen steps down

Robert J. Young has been elected president of Hill Hubbell Co., a subsidiary of National Castings Co., of Cleveland. Milton M. Bowen, president since 1960, will retire from active management, but will consult the company in matters concerning expansion of business and future planning. He will continue as a director.

Young, 46, has been vice president and general manager of Hill Hubbell since 1960, and has been with the company for 25 years. Bowen, a veteran of the pipe-coating industry, has been with the company since 1936, and an officer since 1944.

Demco appoints representative

Announcement has been made in Oklahoma City of a new sales representative for Drilling Equipment Mfg. Co. D. L. Knight, general manager, reported that Cletus Brewer has been assigned as sales representative for Oklahoma under the supervision of Russell Vaught, Demco district sales manager.

HAMMERDRIL
PERCUSSION POWER
ON YOUR AIR·GAS ROTARY RIG

USES FEWER BITS

four corners

San Juan County, Utah — Drilling rate in the Chinle shale using the Hammerdril was over ten times greater than in a nearby mud-drilled well. In addition, only two bits were used between 1,200 and 2,400′ with the Hammerdril, while 48 bits were used in the same interval and formations in the mud-drilled well.

permian basin

Pecos County, Texas — Because of insufficient air volume, the Hammerdril was held back to a rate of 27 ft/hr. Sloughing conditions in the hole forced mudding-up, and the drilling rate dropped to 5.8 ft/hr. Using the Hammerdril, bits averaged 667 ft, after changing to mud, bits averaged only 82.3 ft.

oklahoma

Pittsburg County, Oklahoma — In a test in hard sand, shale, and lime conventional air drilled at 12 ft/hr with 61 ft/bit. The Hammerdril averaged 20.8 ft/hr and over 77 ft/bit.

west virginia

Greenbriar County, West Virginia — In spite of inadequate compressors, Hammerdril averaged 22.5 ft/hr and 540 ft/bit, while conventional air rotary drilled only 8.6 ft/hr and 220 ft/bit.

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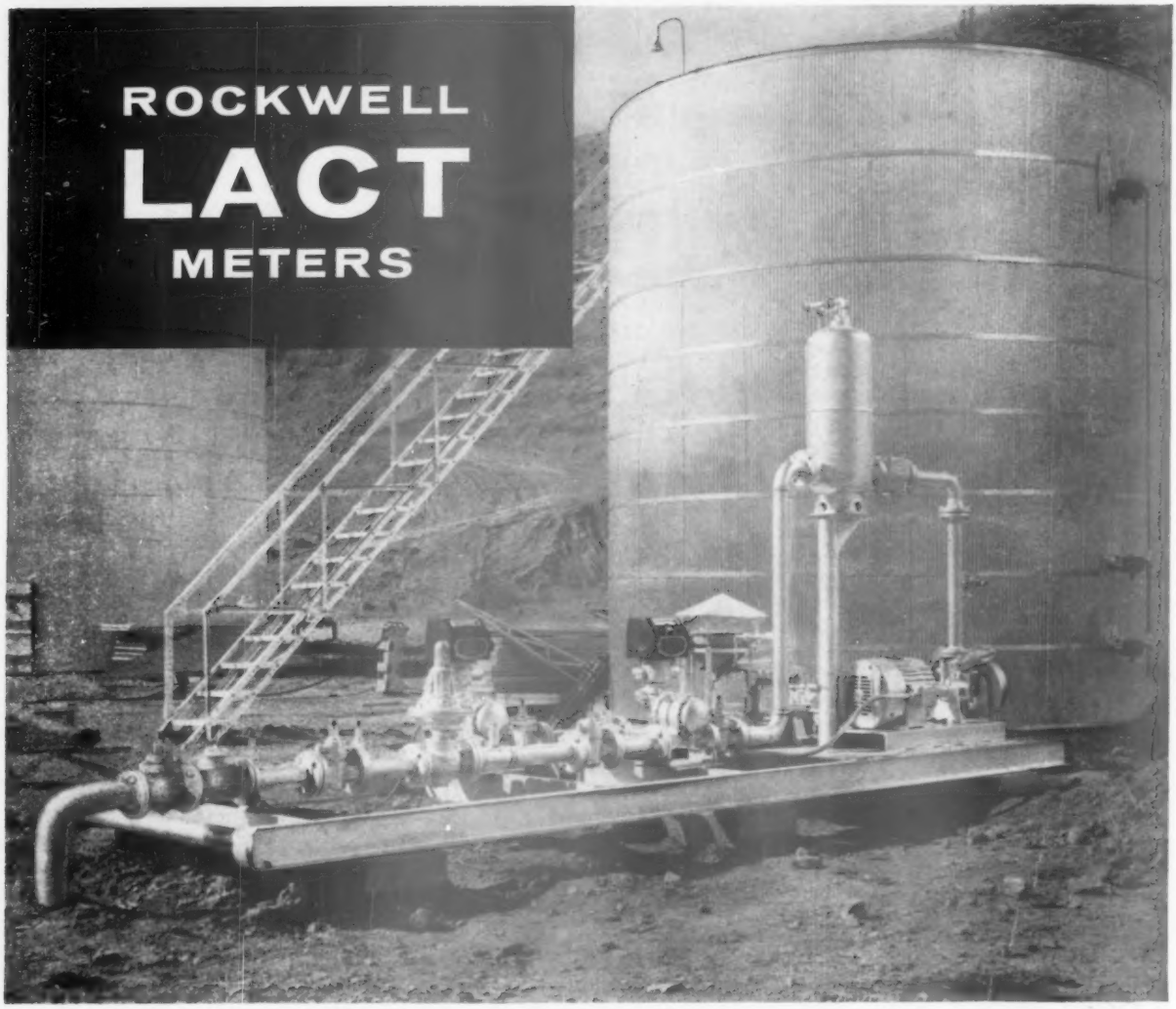

Cut transfer costs— keep records straight

Metered ACT and LACT systems are in your best interests. They provide printed records for proof of conservation control. They lower your operating costs. They verify all quantities transferred. And metered systems provide reliable records for billing purposes as well as firm facts upon which to base royalty and tax obligations.

Rockwell meter systems combine *all* the components you need for protection and savings on your lease. Rockwell meters have an all-revolving measuring mechanism which turns freely on anti-friction bearings without metal-to-metal contact. Rockwell air eliminators insure accurate measurement of liquid volume by removing all entrapped vapors. Automatic temperature compensators translate metered measurement to a uniform base temperature. Ticket printing registers simplify your accounting. Electric impulse contactors actuate remote counters and/or control solenoid valves or pumps for automatic shut-off.

Rockwell meter systems have a proven record of success in oil fields throughout the world. For full facts write: Rockwell Manufacturing Company, Dept. 132L, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ontario.

OIL FIELD METER SYSTEMS

another fine product by

ROCKWELL

Brewer, who worked for a year as a member of the company's home-office staff, will continue to make his headquarters in Oklahoma City.

Porta-Kamp Mfg. Co. appoints sales and manufacturing veeps

Floyd Bigelow, president of Porta-Kamp, Houston manufacturer of portable field housing, has an-

J. F. Herold

C. K. Vincent

nounced the appointments of John F. Herold as vice president in charge of sales, and Clarence K. Vincent as vice president of manufacturing.

Herold has served as export manager for Baroid Sales, vice president of Camco, Inc., and vice president of Herold Packing and Herold Supply, as well as director of purchases for several Texas companies. Vincent, in his new post, will be responsible for manufacturing Porta-Kamp's line of collapsible, portable, semipermanent, and permanent buildings for world-wide use.

Ralph H. Smith elected director of Dowell of Canada, Ltd.

A. C. Polk, president of Dowell of Canada, Ltd., recently announced the election of Ralph H. Smith as a member of the board of directors. Smith is vice president and director of sales for Dowell Division of the Dow Chemical Co. Dowell of Canada, Ltd., with general offices in Calgary, Alta., is a subsidiary of Dow Chemical. The company furnishes oil and gas-well stimulation and cementing services and industrial-cleaning service to the industry in Canada.

Johnston Testers opens Sonic pump office in Evansville, Ind.

Establishment of the first sales and service office in the tri-state area for the Sonic oil-well pump was announced recently by Johnston Testers, Inc., of Houston. Located in Evansville, Ind., the office has been staffed with Johnston field

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MORE HOLE FASTER

four corners

San Juan County, Utah — Between 1200 and 2400' in the Chinle shale a rate of 111 ft/hr was made with the Hammerdril. In a nearby mud-drilled well the rate of penetration was less than 3 ft/hr.

permian basin

Pecos County, Texas — With an 8¾" carbide insert bit, conventional gas rotary made 47 ft/hr at 7,500 ft. Hammerdril started in hard limestone at 7,672 ft with a less expensive *conventional* bit and made 84 ft/hr.

rocky mountains

Park County, Wyoming — Natural gas was used to drill 1,492' of 7⅞" hole through shale and sand, 504' with rotary and 988' with the Hammerdril. The penetration rate with the Hammerdril was 90.2 ft/hr, 85 per cent faster than with conventional rotary gas drilling.

arkansas

Pope County, Arkansas — Drilling 7⅞" hole in hard shale with sand streaks, the Hammerdril averaged 37.7 ft/hr with 3,000 to 12,000 lb on the bit. Conventional air rotary drilled at 8 ft/hr with weight on bit of 20,000 lb.

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"Things are really looking up since we moved our account to Bank of the Southwest. They helped us increase our returns from our oil and gas properties."

"They're our bank, too. Their officers understand the problems of the oil man."

Bank of the Southwest

NATIONAL ASSOCIATION, HOUSTON

Member F. D. I. C.

engineers trained in pumping problems associated with the Midwest area.

Taylor Instrument Cos. forms new export sales division

Taylor Instrument Cos. has established a division within its industrial sales department devoted to the promotion and sale of products outside the United States. Known

P. F. Gilman

W. J. Berk

as the export division of industrial sales, it will be headed by Philip F. Gilman, divisional manager. Gilman will also be area manager for the U.S.A., responsible for orders placed in this country for shipment abroad. In this latter capacity he will be associated with the company's international sales division.

The company also announced that it had combined its petroleum and chemical sales divisions and placed William J. Berk in charge of the new Petro-Chemical Division. He will also act as assistant industrial sales manager in charge of all industrial sales department product programs. Berk joined Taylor in 1950 as an application engineer, transferring to the sales department in 1955 as manager of petroleum sales.

Gelograph Oil Field Services elects Otto Thompson to board

Thompson has been with Geolograph in various management capacities since June 1954 and presently is director of public relations for the Oklahoma City concern. Previously he was with Denver Producing & Refining Co. for 18 years, starting as head of the accounting department. He later served in the drilling, producing, and refining divisions until 1949 when he sold his interest in the company and re-

HAMMERDRIL
PERCUSSION POWER
ON YOUR AIR·GAS ROTARY RIG

FASTER/STRAIGHTER IN CROOKED HOLE COUNTRY

four corners

La Plata County, Colorado — In the Mancos formation deviation was 6° using conventional air rotary and could only be maintained with 2,000 lb on bit. With the same weight the Hammerdril drilled from 6140′ to 7492′ at a rate of 49 ft/hr, double that of conventional, but maintaining the same degree of deviation.

permian basin

Bandera County, Texas — Hammerdril began in a 8¾″ hole at 2,881′ with deviation at 3¼°. Using between 3,000 and 10,000 lb on bit, the Hammerdril maintained the 3¼° deviation and drilled 61 per cent faster than conventional air drilling. If the Hammerdril had been used on the entire well, a saving of $17,000 was estimated.

rocky mountains

Park County, Wyoming — Low weight on bits was carried to minimize deviation resulting from steeply dipping formation. With the Hammerdril, using weights less than 2,000 lb, the penetration rate was 35.4 ft/hr. With gas rotary the rate was 13 ft/hr.

canada

Alberta — Hammerdril was used to drill a 6¾″ hole from 7,400 to 9,751 ft. Extreme hole deviation necessitated low weight on bit. Drilling rates up to 160 ft/hr were made through formations that drilled at 20 ft/hr with conventional rotary air drilling. The rate on a nearby mud-drilled well was 12 ft/hr.

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Field a powerful INTERNATIONAL team like this for servicing: Here's one good example, showing a model B-170 wire line unit (left) in action with a model RF-192 pulling unit.

Good example of a solid, dependable pumping operation: Here you see (left to right) INTERNATIONAL Models RDF-190, RDF-210-H and DCOF-417 teaming up on the job.

When the special equipment costs more than the chassis...

Oilmen depend on INTERNATIONAL Trucks for service in servicing problems

And this makes good sense, because INTERNATIONAL makes the most complete line of trucks for every function in oil field servicing operations.

When the biggest part of their time is spent at the well site, trucks for servicing not only have to get there, they have to perform when they do. They have to be built to take the pounding of long hours as stationary power units. And INTERNATIONAL Trucks can take it . . . they're built that way.

Increasingly, oil field servicing firms are finding that they can't beat an INTERNATIONAL Truck for adaptability, durability and dependability . . . and for the "guts" that other units can't deliver.

Why don't you take your servicing equipment problems to your INTERNATIONAL Dealer or Branch? You will find oil field specialists ready to help you engineer the truck application you need. International Harvester Company, Chicago.

INTERNATIONAL® TRUCKS WORLD'S MOST COMPLETE LINE IH®

FOR THE BEST IN OFFSHORE DRILLING CONTRACT SERVICE

Owners and operators of the largest fleet of deepwater mobile drilling units in the world, **The Offshore Company** pioneered in developing the Self-Elevating Mobile Platform. Rig 58, shown here en route to a location in the Caribbean, is a platform of this type which was designed for use with a tender vessel. Rig 59, a sister unit, has been placed in service drilling in South Atlantic waters off the coast of Africa.

Look to **The Offshore Company** for efficiency and dependable economy in any drilling situation—deepwater locations, shallow waters, and land operations—through more than 25 years of experience and **selection of the correct type of drilling unit for the job.**

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SUBSIDIARIES: Canada—**Northern Offshore Drilling, Ltd.**; Venezuela—**Offshore Venezuela, C. A.**; Worldwide—**Offshore International, S. A.**

tired as general manager. Thompson later joined Harper-Turner Oil Co., of Oklahoma City, and was with that company 4 years.

G-E Communications assigns James Pitman to new position

James E. Pitman has been named manager of marketing research and planning for the General Electric Communication Products Department, Lynchburg, Va. Previously manager of product planning for point-to-point communication, Pitman now will be responsible for marketing research on all product lines made by the department. He will also handle evaluation and planning relative to new market opportunities.

Technical Oil Tool Corp. names three new distributors

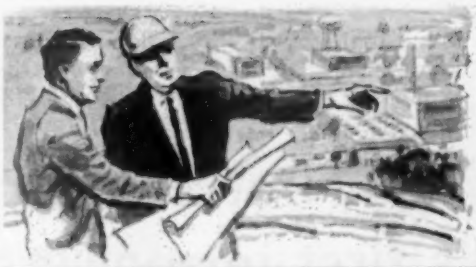
Appointed distributors in their respective areas for Technical Oil Tool Corp.'s end-point analyzers and initial boiling-point analyzers are EPCO Services, Mount Prospect, Ill.; Melvin Fusfeld, The Hague, Holland; and Kirk Equipment, Ltd., Montreal, P.Q., Canada. Totco analyzers are designed to provide continuous precision control of end-point or initial boiling-point in refinery or petrochemical-plant operations.

Colorado Fuel & Iron Corp. elects new directors

Leonard C. Rose, former executive vice president, has been elected president and a director of the corporation. Alwin F. Franz, president since 1952, was named chairman of the board. Charles Allen, Jr., who has served as chairman since 1945, will maintain close association with CF&I as chairman of the executive committee.

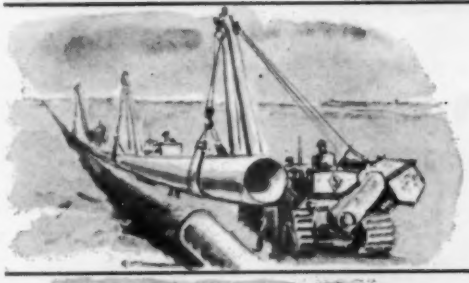
O-C-T transfers John Welch

Oil Center Tool Co., of Houston, has transferred John Welch from Brookhaven, Miss. to Tyler, Tex. At his new location, Welch will serve as a sales and service representative.



FEASIBILITY STUDIES

PROJECT ENGINEERING



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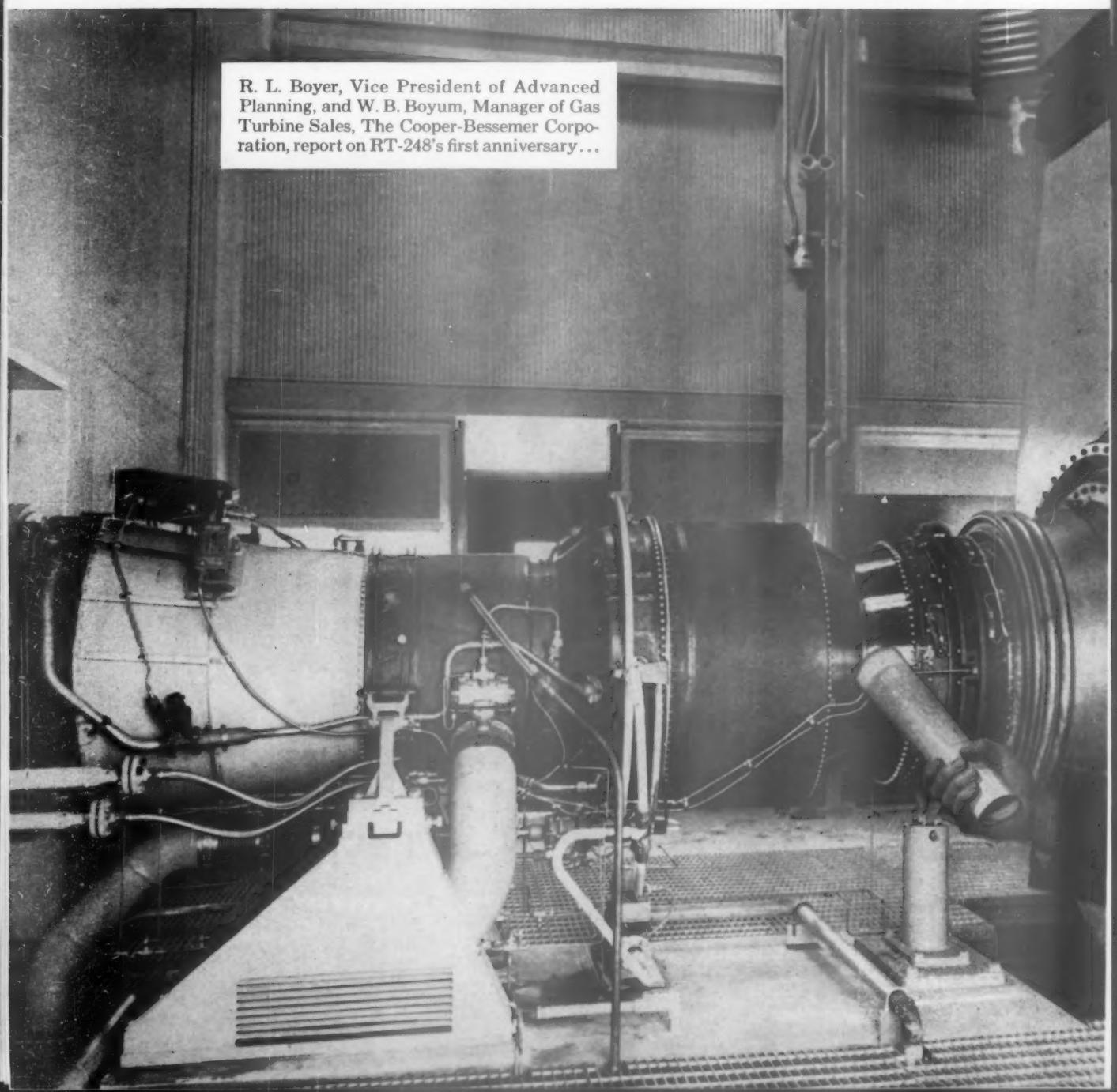
First anniversary report on world's first jet-powered gas turbine



R. L. Boyer, Vice President of Advanced Planning, and W. B. Boyum, Manager of Gas Turbine Sales, The Cooper-Bessemer Corporation, report on RT-248's first anniversary...

The Cooper-Bessemer RT-248 gas turbine shown below started operation on October 31, 1960, at Columbia Gulf Transmission's Clementsville (Kentucky) compressor station of the Columbia Gas System. Here's what it proved after the first year in service:

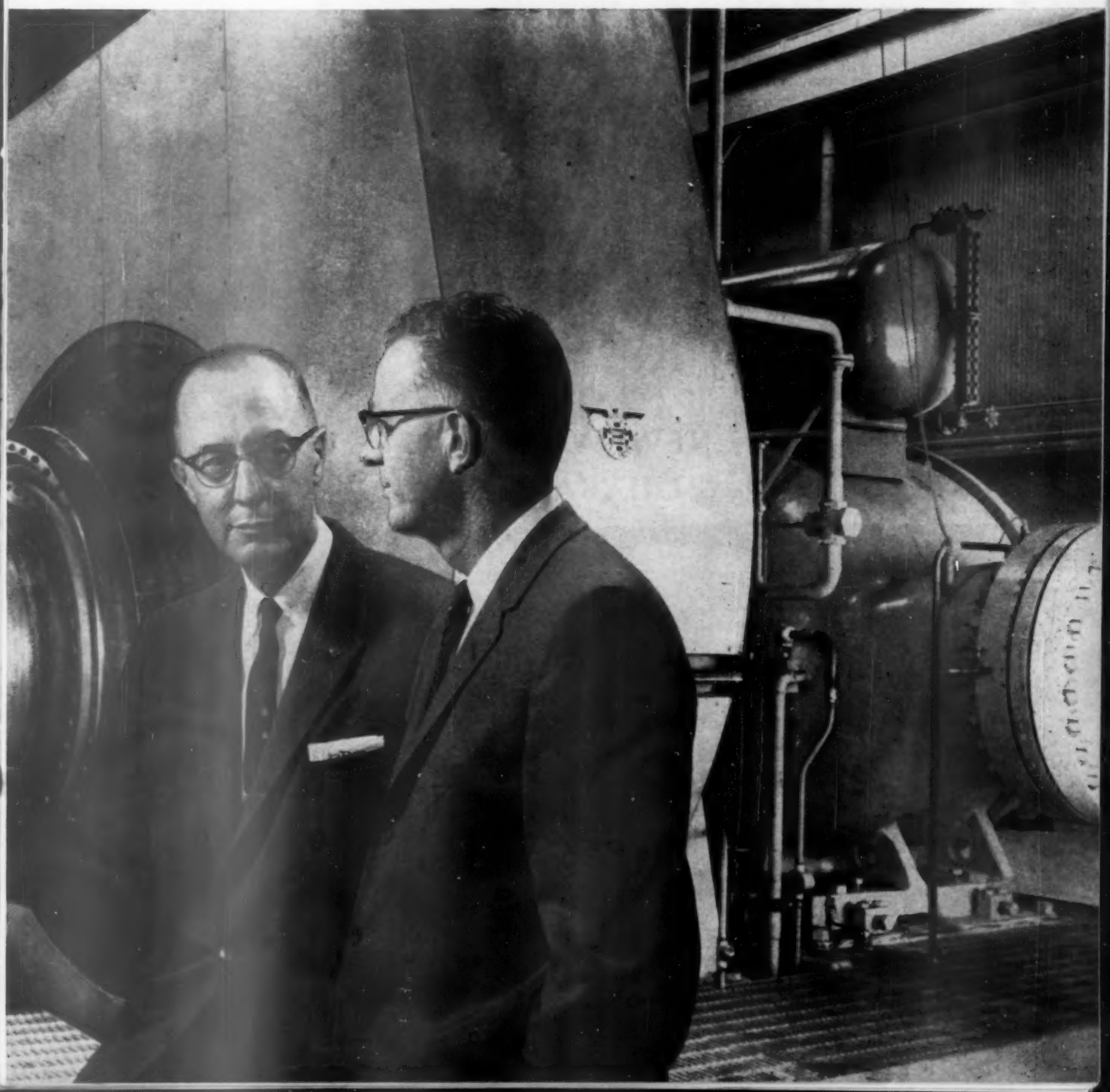
• Unparalleled overall economy of operation, as expected. • Exceptional reliability and availability, proven by 6500 hours of heavy-duty service with average load in excess of its 10,500 hp rating. • Simplicity and ease of control. Since June 20 has operated remotely from Nashville. • High efficiency (25%) without costly, bulky regeneration equipment. • Lower overhaul and downtime expense than with other comparable prime movers. Unit exchange concept with factory reconditioning of "jet" simplifies maintenance.

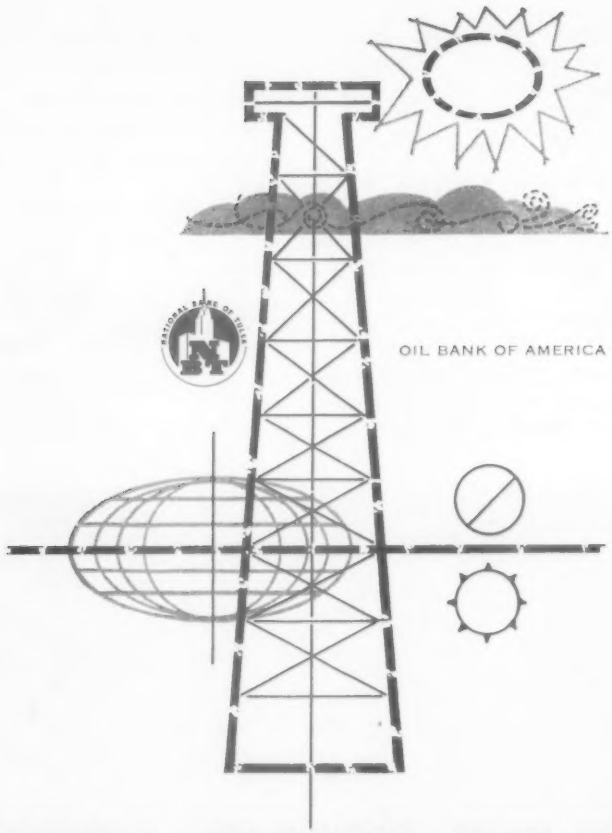
The RT-248 is a joint development of Cooper-Bessemer and Pratt & Whitney Aircraft. For further information on this and other C-B gas turbines, from 340 to 15,000 bhp, for all power applications, contact our nearest office.

Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINES: GAS · DIESEL · DUAL-FUEL
JET-POWERED GAS TURBINES





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NBT is proud that its recent remodeling program has not only brought about physical changes, but has also helped to create a New World of Banking. This is especially true in NBT's Oil Department where

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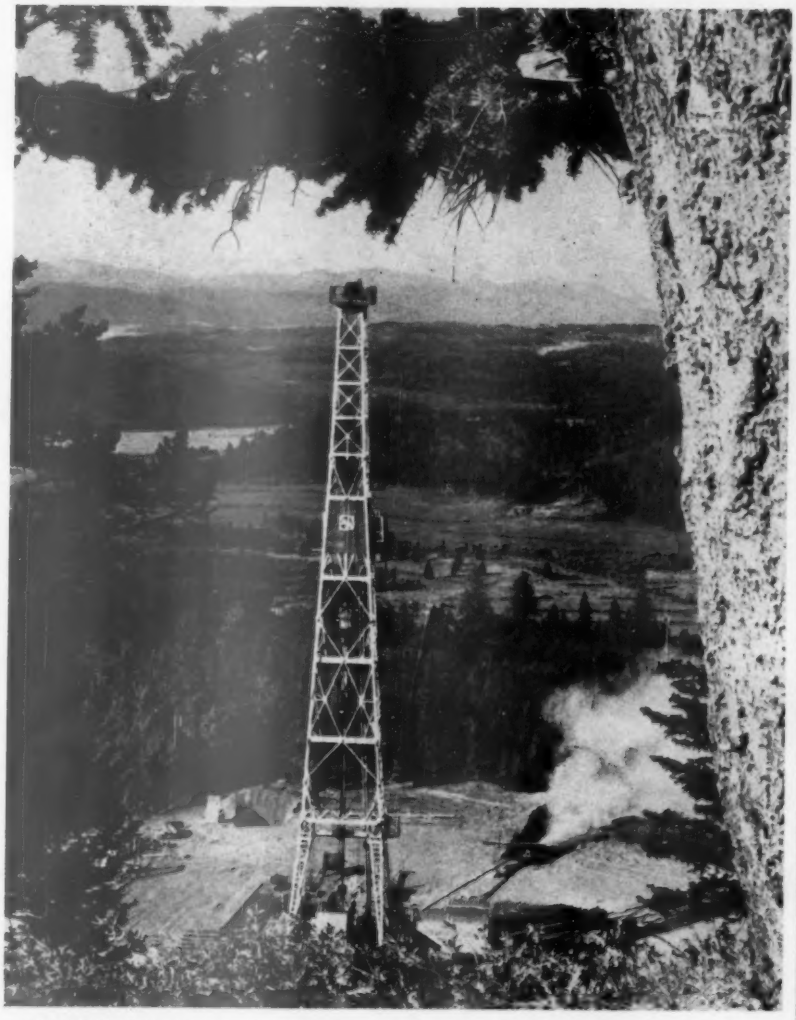

CONTRACTOR for this Wildcat Hills, Alberta, well is Duke Drilling Co., Ltd.

Development wells drilling in Alberta

HERE'S the setting of a British-American-CPR development well in the Wildcat Hills area of Alberta. Location is about 30 miles northwest of Calgary in the foothills area.

Wildcat Hills gas field was discovered in December 1958 and activity has been pretty quiet until recently. There are two development wells now drilling. Gas comes from the Mississippian-Turner Valley formation at depths between 10,000 and 11,000 ft.

Gas or air drilling has been done in this region quite extensively during recent months in effort to determine a fast lower-cost method of drilling. The contractor is Duke Drilling Co., Ltd.

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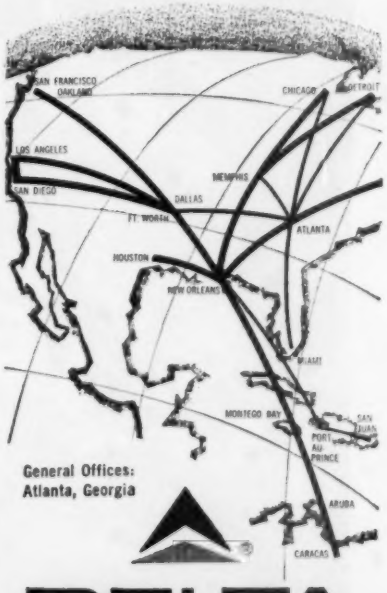

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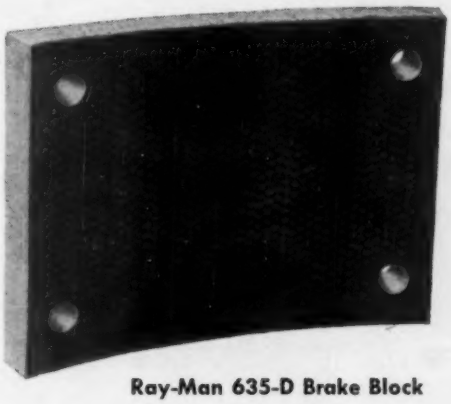
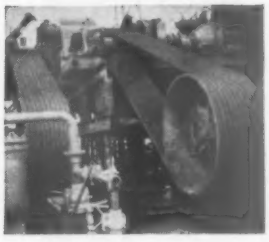


Ray-Man 635-D Brake Block



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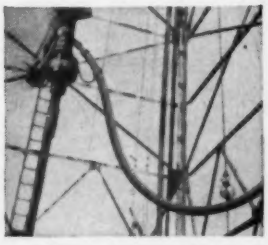

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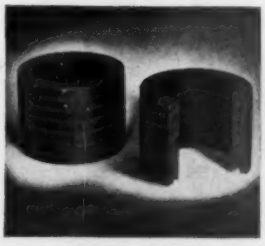

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Member F. D. I. C.

AAODC subcommittee on rotary drilling weight, speed, and penetration—headed by Jack Knowlton of Martin Decker Corp. of Long Beach—made more than a dozen field tests during the past 4 years in widely scattered areas. The purpose of these tests was to determine a formula for the driller so that he could use theoretically correct weights and rotary speeds to get the cheapest foot of hole drilled.

Before this field work there was no method of adequately describing bit wear. Strangely enough, there has never been any standard formula, so these people invented their own.

To develop any uniform method for reporting bit conditions, the basic considerations are:

1. It must be simple so that it can be quickly understood and used by all rig personnel.

2. It must be complete so that all extremes of drilling techniques can be included in the use of it.

The people involved in the study included the representatives of major bit manufacturers, contractors, and major operating firms. Here is their proposal for coding bit conditions:

Tooth Dullness (general examination)

T1	tooth height	¼ gone
T2	tooth height	½ gone
T3	tooth height	¾ gone
T4	tooth height	4/4 gone

Note: If any one row has a majority of the teeth broken, add the letters "BT."

Bearing Condition (Check the worst cone)

B1	tight
B2	medium
B3	loose
B4	locked or gone

Bit Gage

I	in gage
O	out of gage

Note: If out of gage, "O" is followed with amount out of gage in inches.

Example 1: T1, B2, I (Teeth ¼ gone, bearing medium, bit in gage).

Example 2: T3, BT, B3 O½ (Teeth ¾ gone, broken teeth, bearing loose, and bit out of gage ½ in.).

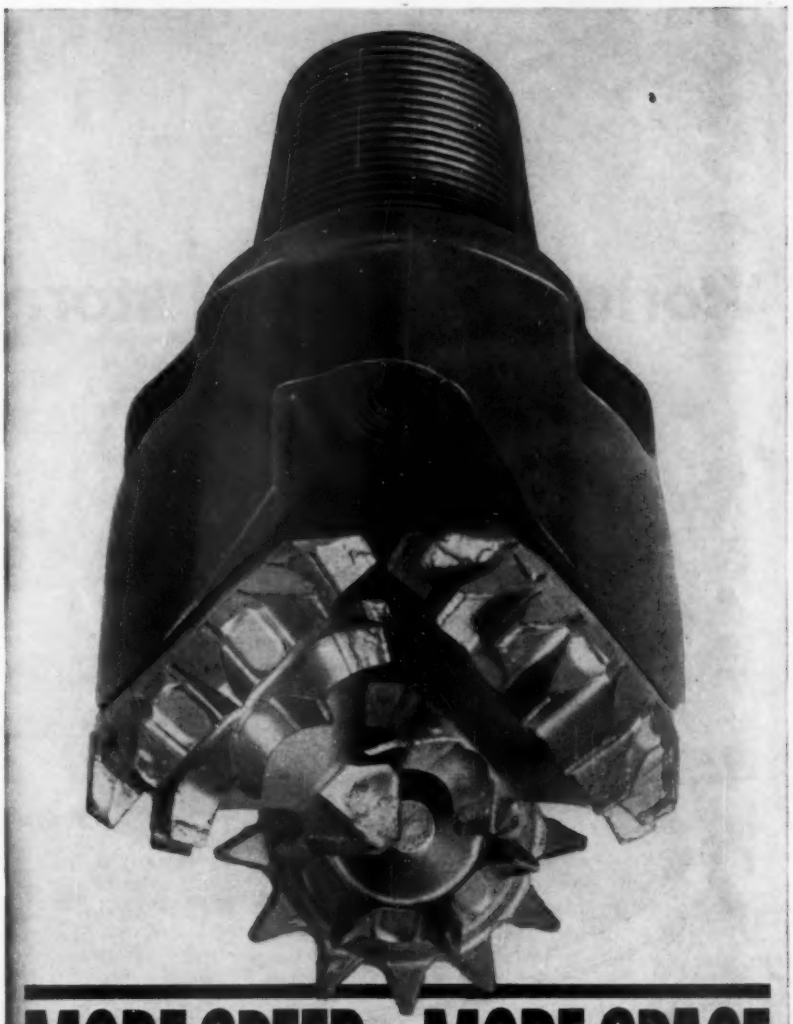
The study group proposed the following recommendations:

1. That the weight-speed committee use this coding in conducing all future tests.

2. That all drilling contractors post this coding on the bit records of their daily drilling reports.

3. That the bit manufacturers carry this code on their bit records.

4. That the AAODC endorse this method of coding, which essentially is the same as that endorsed by Canadian Oilwell Drilling Contractors Association.



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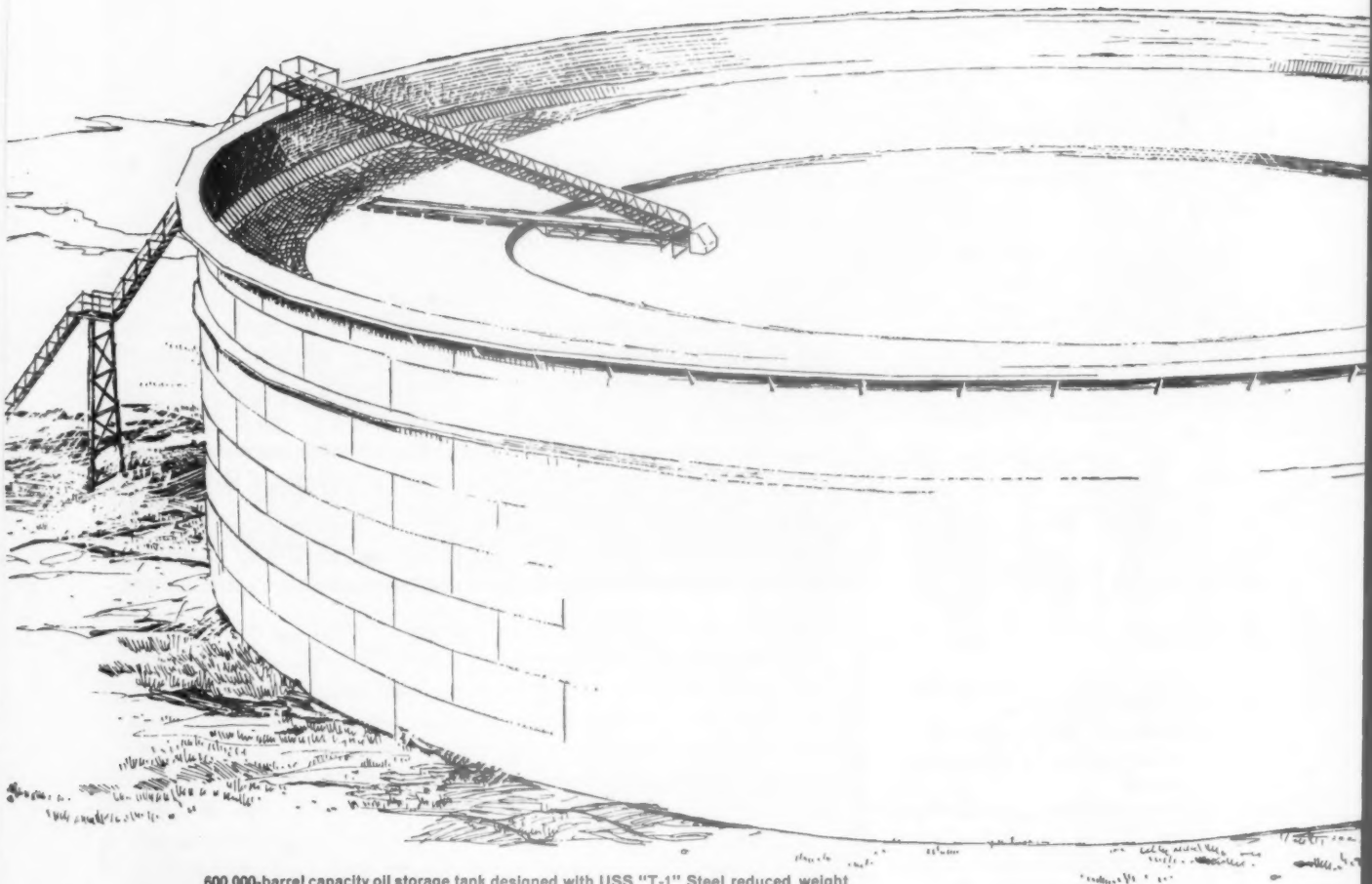
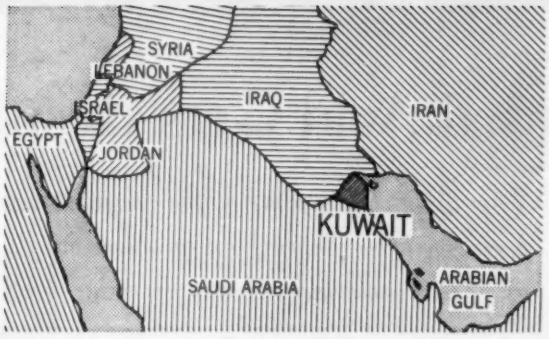


600,000-barrel capacity oil storage tank designed with USS "T-1" Steel reduced weight by about 42%, with substantial savings in fabrication, freight and erection costs.

This mark tells you a product is made of modern, dependable Steel.



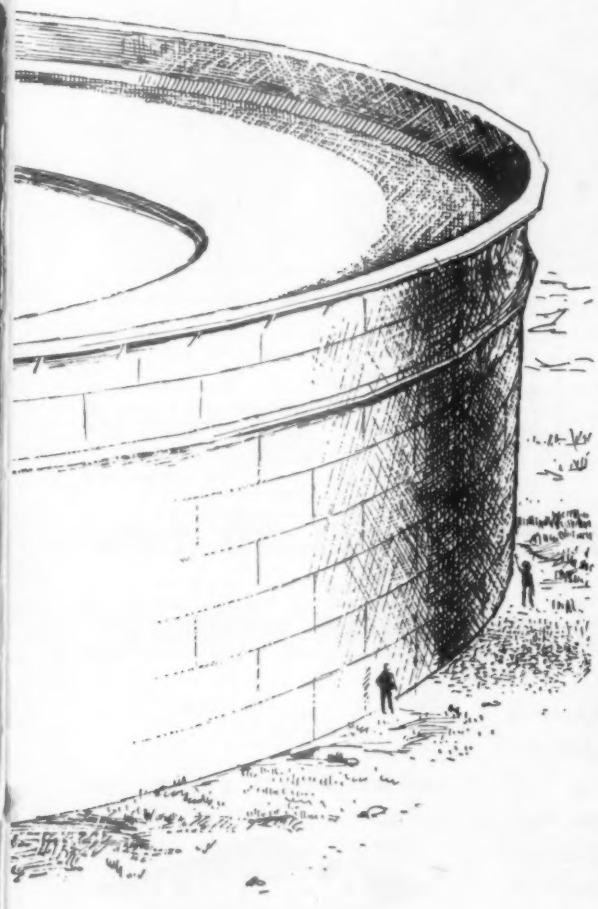
USS "T-1" Steel

A new 600,000-barrel oil tank 260 feet in diameter and 64 feet high has been erected for the American Independent Oil Company in Mena Abdulla, Kuwait, on the Arabian Gulf.

Kuwait is a petroleum paradise. In 1957, its oil production amounted to 56,000,000 tons, and it is still increasing. Most of the oil is exported and a giant storage tank such as this makes it possible to fill one of the new super tankers in one stop, rather than several.

The Chicago Bridge & Iron Company obtained the contract for the tank with a design that took advantage of the *extra* high strength of USS "T-1" Constructional Alloy Steel and its many cost-saving features.

The shell consists of six 8-foot rings of "T-1" Steel, made to 115,000 psi minimum ultimate strength, and two top 8-foot rings made of A 131 grade A carbon steel. The tank has a Horton pontoon floating roof and the bottom of the vessel was made of A 283 grade C plates ¼-inch thick.



USS "T-1" Steel reduces weight. The "T-1" shell thicknesses, which ranged from 1 inch down to ½ inch, were determined on the basis of a design stress of 38,333 psi. This is ⅓ of the minimum ultimate strength of the steel. Joint efficiency was calculated at 100%, with a product specific gravity of 0.90. The top two carbon steel rings were figured for the API 12-C allowable stress of 21,000 psi, with 100% joint efficiency, and with a product specific gravity of 1.0. Steel thicknesses were ½ inch and ⅜ inch.

Although API prohibits the use of carbon steel plates in the thicknesses that would have been needed for the 6 lower rings, by using USS "T-1", 42% less steel was required. Fabricating, shipping, and erecting costs were thus considerably lower than original estimates.

Lower maintenance, too! USS "T-1" Steel has four times the resistance of carbon steel to atmospheric corrosion. Research has shown that paint life is greatly increased on steels of this nature.

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United States Steel

Retarded Acid Gets Results in Problem Wells

This table shows some of the recent results of Retarded Acid treatments performed by Dowell on problem wells in many areas. We hope it gives you some ideas that will result in greater profits from your wells.

LOCATION	NAME OF FORMATION	AMOUNT OF RETARDED ACID	RESULTS
Albert, Canada	Slave Point Mid Devonian Vugular lime	4000 gallons (acid-oil-emulsion type)	Production from old well went from 0 to 218 bopd.
Franklin County, East Texas	Limestone	30,000 gallons	16-fold gas production increase—from 400 mcfd to 6400 mcfd.
San Juan County, Utah	Paradox (Desert Creek Zone)	75,000 gallons (acid-oil-emulsion type)	Production boost from old well was 34 to 450 bopd in field where regular acid treatments are usually unsuccessful.
Ellis County, Kansas	Kansas City Lansing	2000 gallons (acid-oil-emulsion type)	Production nearly three times that of offset wells. $881 treatment cost paid out in 19 days.
Andrews County, West Texas	Pennsylvanian	10,000 gallons (acid-oil-emulsion type)	Production from old well boosted from 10 bopd to 60 bopd stabilized. This 50 bopd increase was made in a field where offset wells treated with 10,000 gallons regular acid usually yield an uneconomical 5 bopd increase.
Logan County, West Virginia	Big lime	4000 gallons	Production increased 100-fold to one million cfpd. Treatment cost paid out in two weeks. Entire well cost paid out in less than five months.
Lea County, New Mexico	Wolfcamp lime	3000 gallons (regular type) 15,000 gallons (acid-oil-emulsion type)	Well tested 275 bopd flowing. Other wells in field, given regular acid treatments, do not usually respond properly.
San Juan County, Utah	Paradox	40,000 gallons	Decline rate was reduced by treatment. Production was increased from 200 bopd to 700 bopd. Six months later production was still 700 bopd.
Alberta, Canada	D2	5000 gallons	Production from eight-year-old well had declined to zero with fluid level only 65 feet. One month after treatment, production had leveled off at 100 bopd, flowing.
Russell County, Kansas	Kansas City limestone	3000 gallons	Production boosted from 3 bopd to nearly 2000 bopd on test after clean-up.
McKenzie County, North Dakota	Madison lime	7000 gallons (acid-oil-emulsion type)	Production from old well increased from 35 bopd to 133 bopd after treatment. $3101.00 treatment paid out in 23 days.
Harrison County, East Texas	Pettit Oolitic lime	7000 gallons	Treatment of six-foot pay resulted in 40 mmcfd well with 60 barrels petroleum liquids per million.
Wabash County, Illinois	O'Hara lime (Highly soluble)	3000 gallons (acid-oil-emulsion type)	Well production stabilized at 75 bopd and treatment cost paid out in ten days. Regular acid had given poor results on nearby wells.
Fremont County, Wyoming	Embar lime	5000 gallons (acid-oil-emulsion type)	21 boph test from a pay that had been acidized and abandoned several years before. This treatment saved a well that would have been plugged otherwise.

Almost without exception, these treatments employed other Dowell products and services in addition to Retarded Acid. Most of the more recent treatments listed here were designed by Dowell engineers with the aid of the Acid Guide* – a method developed by Dowell for use in engineering acid treatments to get optimum results.

Take full advantage of Dowell's long experience, proved additives, and engineering ability. Call Dowell to perform your next acidizing treatment. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, Germany, France and the Sahara area. Dowell, Tulsa 1, Oklahoma.

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CHAMPLIN'S SEBRING: Needed—fewer people who can say "No."

Who gets there first with the most—company geologist or independent?

BY FRANK J. GARDNER

WHO'S LIKELY to find more oil—the independent geologist or the organization man? It's a moot question. But at least one authority believes it's the independent.

Speaking to the Gulf Coast Association of Geological Societies in San Antonio recently, Louie Sebring, Jr., district exploration manager for Champlin Refining Co. at Corpus Christi, told his cohorts that the independent's prospects have a much better chance of being drilled than those of the company man. Logic dictates that the more you drill, the more you find—hence Sebring's conclusion.

"The self-employed geologist has the advantage of the most basic of all incentives," the speaker said, "— the need to provide food, shelter, and clothing for himself and his family. He does this through his work in the search for new reserves of oil and gas. Until his efforts are rewarded by enough success to fulfill these needs, he will necessarily make a persistent effort in this search."

What's more, he gets direct credit for his work, and when he once hits pay dirt, he finds little trouble in selling the next prospect. "A successful independent geologist often can sell a prospect to his financial supporters . . . by a selling effort so small as to be ludicrous if attempted by any company geologist," Sebring said.

Besides this incentive, the independent has a freedom of action and decision that is denied the company man. He can sell what he chooses to whom he chooses when he chooses. "This means," the speaker declared, "he will work when he feels that his efforts will be most likely to be crowned by success, where he can acquire acreage . . . and where he can sell . . . Probably the major exploratory advantage . . . is that he can sell his prospects in a multiple market. If one of his clients does not find a prospect to his liking, the independent geologist can simply submit the prospect to another." As a result, Sebring feels that such targets will be tested much more thoroughly than those generated by the company geologist.

On the other side of the coin, Sebring pointed to the advantages enjoyed by the company geologist that are denied the independent. Security, vast economic resources, and almost unlimited information at his fingertips. Some may doubt the security angle, the speaker said, but until the independent has attained financial success, it must be admitted that the company man has more immediate security.

So much for the advantages of both. How about the disadvantages? The self-employed oil hunter hasn't the assurance of a pay check tomorrow. Nor does he have a company drilling budget to play with. And he often has too little information in his files. But given enough success on a few of his prospects, and all three of these worries disappear.

The company man finds it much harder to surmount his disadvantages . . . and he has them, according to Sebring. And it's up to management to see that he gets help. He must be provided with incentives both mundane and professional. He must be given as much freedom of action as possible. And he should be freed from needless tasks that don't help find oil. But most of all, in the absence of the independent's multiple market, he must be allowed to sell his prospects to management in as simple a way as possible.

In many companies, the geologist faces "an almost impenetrable hierarchy," Sebring contends. "He needs fewer people who can say 'no' to him before he gets to the spending authority."

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For both contractor and company, the blue ink on a *complete* Drilling Recorder chart helps put more "black" ink on the books. Today's competitive conditions demand maximum efficiency, in drilling, in supervision, in analyzing structures drilled.

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One driller, for example, noted on his chart that pump pressure gradually was dropping though pump operation had not changed. He pulled the string, found a hole in the pipe that soon would have caused a twist-off, saved anywhere from one to fifty thousand dollars in fishing costs.*

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*An actual case. Details on request.

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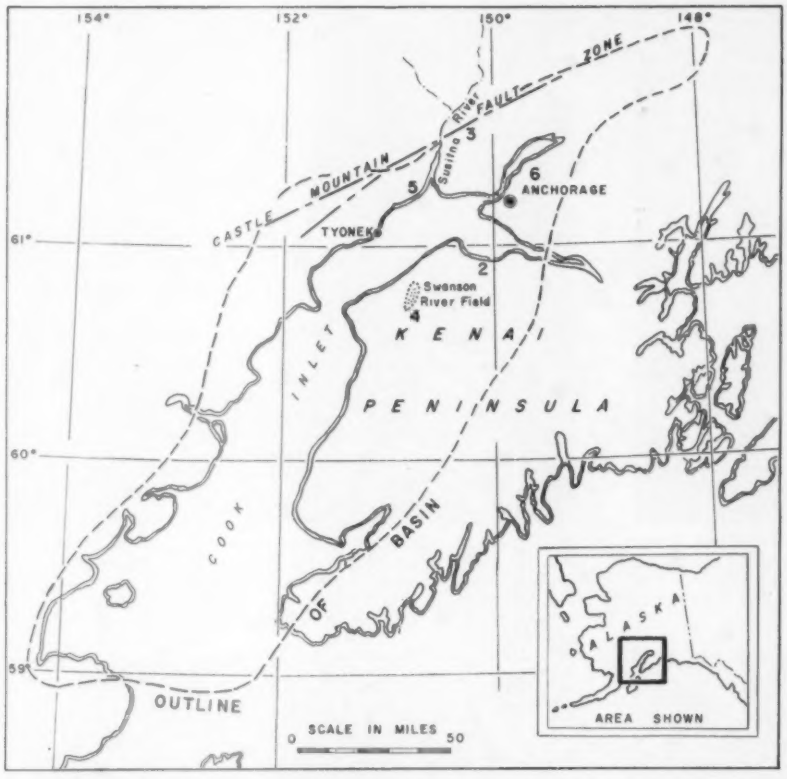


ON INDEX MAP of the Cook Inlet basin, Alaska, numbered areas correspond to the photo localities shown in Figs. 2-6. Fig. 1.

Photogeology

—a quick, economical tool for oil hunters

Perhaps the best application of photogeology in exploration is photogeomorphology because it develops creative thinking and imagination.

About the author...

Thomas E. Kelly received his MS degree with a major in geology from Texas A & M College. He has worked in the oil fields as a roustabout, roughneck, Schlumberger operator, and mud engineer. From 1956 to 1958 he was employed as a geologist with Continental Oil Co. Since 1958 he has been with Halbouty Alaska Oil Co., first as resident geologist, and currently as geologist and manager of Alaskan operations with offices in Anchorage, Alaska. He has written several papers on the geology, oil, and gas of the Cook Inlet basin, Alaska.

PHOTOGEOLOGY is recognized by today's practical oil finders as a fast, low-cost method in geologic reconnaissance investigations. Although the field of photogeology has many applications, it is perhaps in the field of geomorphology that photo interpretation realizes its greatest service to exploration. Photogeomorphology develops, as much as any other branch of applied geology, the two basic ingredients that make good exploration geologists—independent creative thinking and imagination.

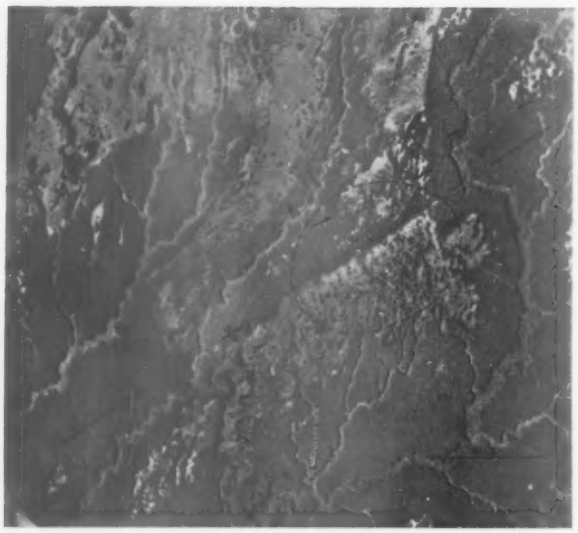
Many geologists believe that the usefulness of a geomorphic investigation is impaired in an area such as the Cook Inlet basin where bedrock is effectively masked by thick glacial deposits. Characteristic drainage patterns, sometimes indicative of structural uplift, are not well developed in glacial-covered areas; the classic drainage in glaciated regions is said to be disordered, to which no significant structural control can be imparted. This generalization does not hold true in the Cook Inlet area because the basin is located in a tectonic mobile belt and has experienced dynamic growth throughout its history. Rejuvenated uplift along old trends has been so recent that late Pleistocene and Quaternary glacial deposits exhibit surface expressions of deep-seated movement. Mild to moderately severe earth tremors are frequently recorded in the area. Such movements confirm that deformation in the basin is continuing.

Geologic Summary

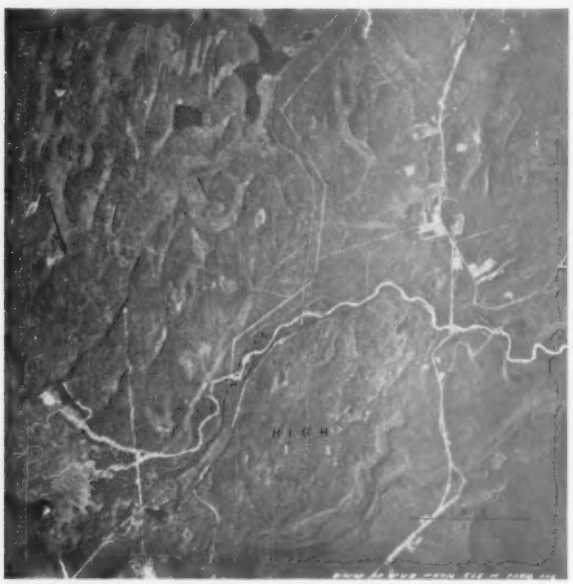
The Cook Inlet basin of South Central Alaska is an intermontane structural basin approximately 14,000 sq. miles in area (Fig. 1). Landforms throughout the basin are depositional and erosional features resulting from extensive mountain and piedmont glaciation. Glacial debris and glaciofluvial deposits cover most of the lowland areas except along the west and north shores of Cook Inlet where broad tidal flats occur. Active glaciers are present in the mountains flanking the basin on the east and west.

The Cook Inlet basin is located at the northwestern end of an arcuate tectonic belt sometimes referred to as the Pacific Cordilleran mobile belt. The structural basin began in early Jurassic time and developed into the present elongate

PHOTO OF GEOMORPHIC ANOMALY at north end of Kenai Peninsula. Anomalous evidence is: tonal halo indicating topographic high, radial drainage to north, and major stream deflection to east (upper right). Note arcuate former shore line abandoned due to uplift or filling. Fig. 2.



IN AREA OF THICK MORAINE DEPOSITS, well-defined fault line is indicated by vegetational alignment. Dashed area is higher relief than adjacent areas and drainage pattern is structurally controlled. Uplift and faulting changes streams at "x" and "y." Small faults or fractures occur between arrows. Fig. 3.



NEAR EAGLE RIVER, ALASKA, is example of depositionally controlled drainage. Topographic high is emphasized by dissection of end moraine. Looking at high, crude annular drainage deflects river on north and radial drainage is on south and west sides of feature. Note striated look to north caused by drumlins. Fig. 4.

PHOTO OF DRAINAGE ANOMALY at south end of Swanson River field in area where glacial knob and kettle topography exists. This is example of normal drainage habit that is abruptly changed and deflected to southeast. Subsurface axis of Swanson River anticline is shown. Fig. 5.

topographic basin during late Cretaceous and early Tertiary deformation.

As much as 18,000 to 20,000 ft. of moderately to loosely consolidated Tertiary coal - bearing sediments overlie strongly indurated marine and nonmarine Mesozoic rocks.

Regional subsurface - fold belts manifest in the Tertiary sequence are related to deep-seated movements in the Mesozoic or basement rocks and to draping and differential compaction of the Tertiary sediments over existing Mesozoic highs. Alignment of regional upwarps and of local closed anticlines associated with regional folding conforms with the dominant north - to - northeast structural grain of the basin.

Photogeomorphology

Photogeologic exploration in the Cook Inlet basin is restricted essentially to applied geomorphology for three reasons: paucity of expected bedrock, low relief of the region, and heavy vegetation cover.

Stereoscopic view of available aerial photographs provides identification of at least four elements of a photogeomorphic study: (1) topographic relief features, (2) drainage patterns, (3) total anomalies, and (4) tectonic features.

Topographic features. Topography is a product of gradation and tectonism in geographically unglaciated

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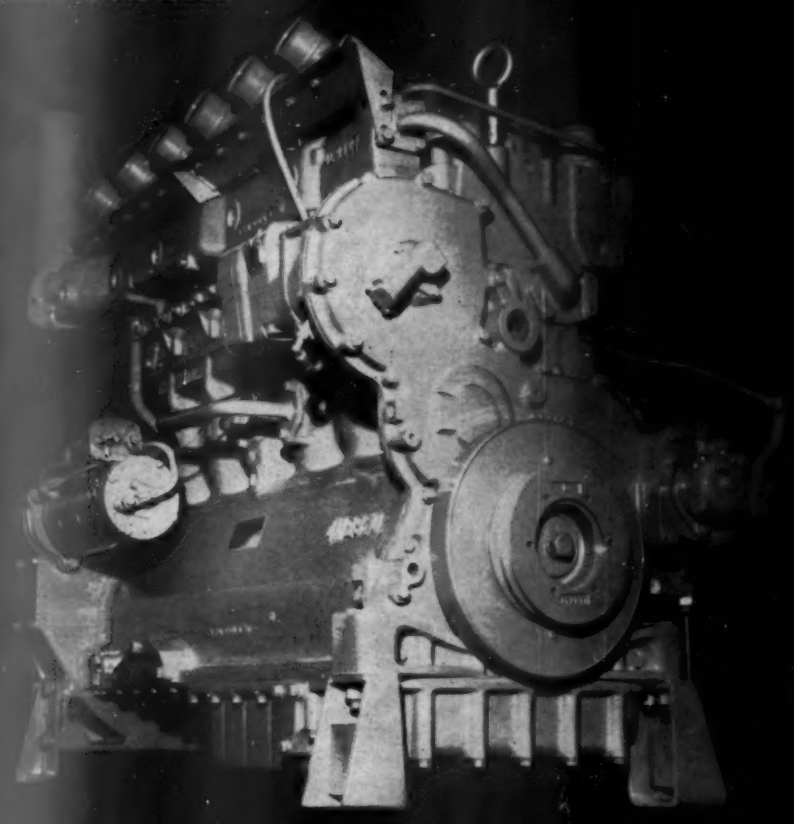

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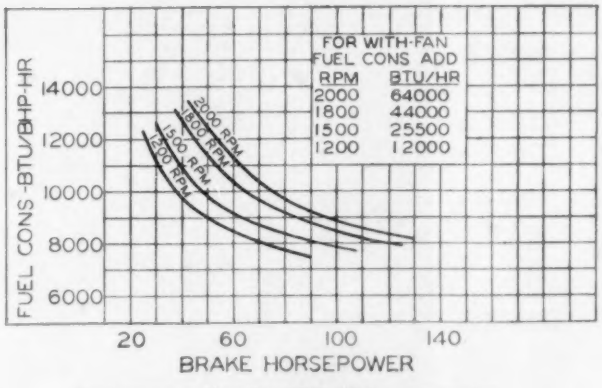

Fuel consumption for G333 (12:1 compression ratio) based on 1000 BTU low heat value fuel.

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LEGEND

GEOMORPHIC OR DRAINAGE ANOMALY
dc indicates deposition controlled

f FAULT LINE

SURFACE ANTICLINE

FRACTURE TRACE

TONAL LINEAMENT

0 Miles 1

THIS GREATLY REDUCED PHOTOGEOMORPHIC MAP of the Tyronek area is presented to show the wealth of information that is obtained from photogeologic maps and consolidated into a single source. Shown are anticlinal axes, and the various anomalies—both structure controlled and depositional features. These along with faults and fracture trends afford almost complete data on a single area. Fig. 6.

HERE IS AN EXAMPLE of a structurally controlled drainage anomaly near mouth of Susitna River. Area of alluvial covered marshland has two south-flowing streams which are deflected eastward. Normal tortuous meander habit is straightened around high. Arrows denote stream segments that appear fracture controlled. Fig. 7.

areas. The landforms in glaciated regions of low relief are largely depositional. The problem is to differentiate between landforms that are the result of deposition and those that may have been influenced by structural uplift.

The dominant surficial features of the Cook Inlet lowlands are moraine deposits, kame fields and terraces, and outwash. Structural control of topographic features is obscured in end moraines but it is frequently implied in deposited ground moraine or till cover, i.e., areas away from the terminus of a glacier where debris is depositionally concentrated. Linear patterns of higher ground such as esker rides and drumlin clusters are difficult to mistake for structural features if the glacial history of the basin is well known. It is in the departure from the normal relief of a particular local or regional area that indica-

tions of structural control are apparent. Abandoned shore lines (Fig. 2), and topography associated with fault lines (Fig. 3) are examples of changes in the norm and are probably related to structural uplift. It is interesting and possibly significant that the only oil field found to date in the Cook Inlet basin is partially located on a broad, till-covered, closed topographic high distinctly visible on topographic contour maps.

Drainage. The courses of the many streams and rivers draining the basin are strongly influenced by prominent glacial landforms but are not necessarily controlled. Stream patterns comprising drainage anomalies may be considered controlled by deposition, controlled partly by deposition and partly by structure, or controlled by structure. Lithology is not a significant factor influencing drainage in the heterogeneous unconsolidated glacial deposits.

Depositionally controlled drainage is clearly shown in Fig. 4, a vertical photograph of the Eagle River area north of Anchorage, Alaska. The glacial deposits are unmistakable in the northwest part of the photo, where the grooved or striated appearance is established by north-to-northwest-trending drumlin clusters. The annular drainage pattern formed by the northerly deflection of a west-flowing river and southerly deflection of an abandoned melt-water channel in the lower center of the photo is influenced by the topographic high that is part of a distinct sinuous end moraine. Drainage off the topographic high is poorly integrated because it is youthful but a weak radial pattern is beginning to develop. In a later stage of the geomorphic cycle, the topographic remnant will probably create a well-defined drainage anomaly that will be unrelated to structural movement.

Fig. 5 is an aerial photograph of the southern part of Swanson River field on the Kenai Peninsula. The most prolific producing area occupies the lobate meander in the upper right of the photo. The abrupt stream deflection and change in channel characteristics are probably controlled by deposition and structure. The course of the river around the south side of the glacial landform (kame?) is depositionally con-

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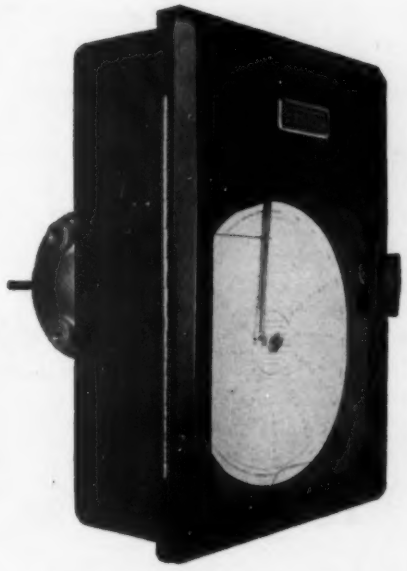

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trolled. Change in meander pattern and absence of prominent depositional landforms at the points where the river begins its southeasterly deflection suggest that the lobate meander locality has been slightly uplifted with respect to the surrounding surface area.

Well-defined drainage anomalies have been developed on recent flood plains and tidal flats. Fig. 2 shows two distinct characteristics of a drainage anomaly: a radial drainage on the recently uplifted or depositionally filled tide-flat area, and sharp easterly deflection of a major stream channel around the postulated uplift. Fig. 7 shows a flat marshland adjacent to the mouth of the largest river in the basin. Thick deposits of recent alluvium and tidal-transported silt cover the area. Abrupt changes in the direction of stream flow and changes in meander habit on both sides of the drainage anomaly without apparent topographic, lithologic, or climatic influence suggest structural influence. The geomorphic anomalies in Figs. 5 and 7 overlie deep-seated magnetic highs which corroborate the interpretation of structurally controlled drainage.

Tonal anomalies. The relation of tonal differences to structural movement is difficult in areas of glacial deposition because of their abundance. A tonal anomaly by definition is any linear, circular, or irregular tonal pattern that differs from the surrounding area except the variation in shades of gray that is normally consistent with the regional geology. Pitted outwash, moraines, and poorly drained swamps exhibit a variety of mottled photographic tones which are not considered anomalies. The irregular tonal halo outlining the drainage anomaly in Fig. 7 is believed to be unrelated to the probable structural uplift in the area. It appears to have been caused by tidal action leaving the area adjacent to the stream channel continually wet and depositing clayey silt with each rise of the tide.

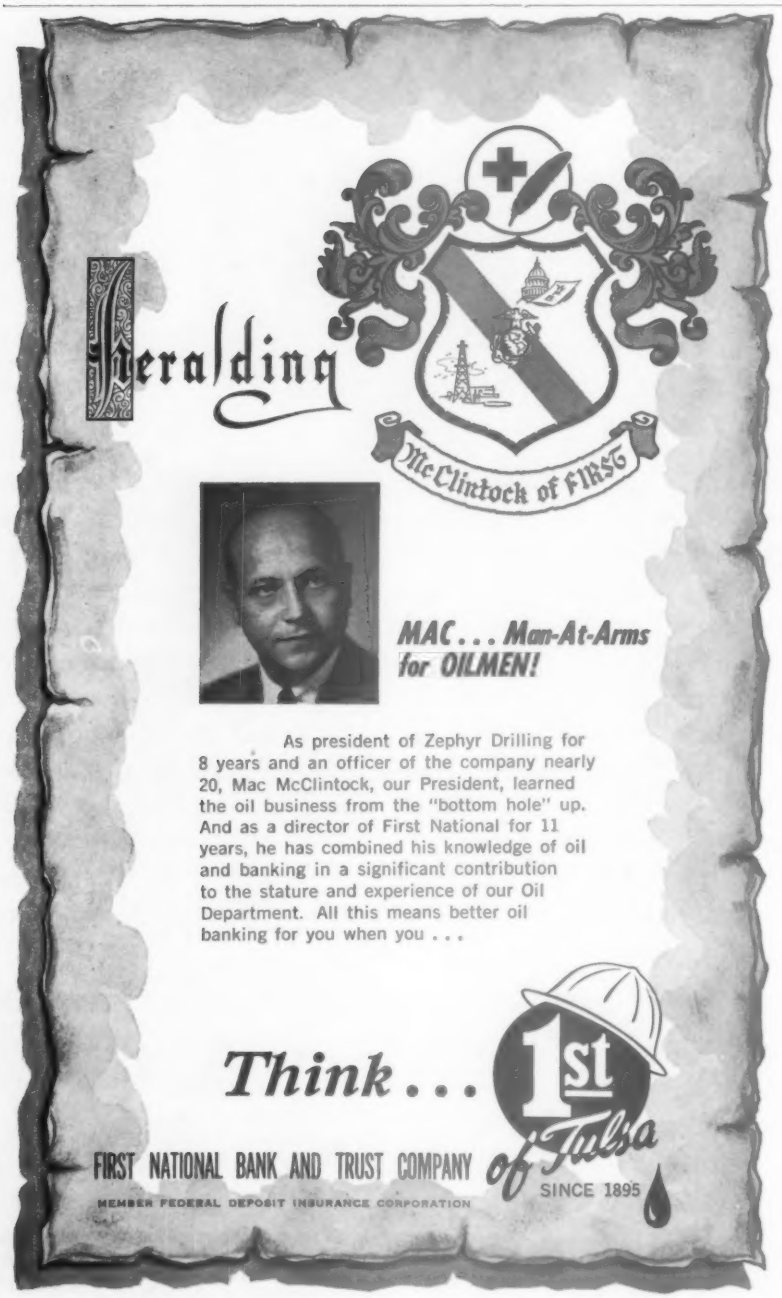
The outstanding halo in Fig. 2 is also not a tonal anomaly in the sense that it was created by forces propagating through the subcrop. The halo is subaerially created by abnormally high tides onlapping the grass-covered, subtle topographic high and depositing layers of gray silt. Here origin is not important; the tonal contrasts effectively outline an area of active uplift.

Total differences are useful in delineating abandoned meander belts, former shore lines, overlapping moraine deposits, and many other geomorphic features that assist in describing the recent geologic history. Because the Cook Inlet basin is actively growing, changes in geomorphic forms may reflect movement along subsurface structural trends.

Straight tonal bands or lineaments are common throughout the basin. These total lineaments may have structural significance and are discussed below under tectonic features.

Tectonic features. Fracture traces and lineaments can be mapped throughout the basin even in areas where drainage is poorly developed. They are visible in recent moraine deposits, alluvium, and tidal mud flats.

The fracture traces are indicated by distinct linear-stream segments,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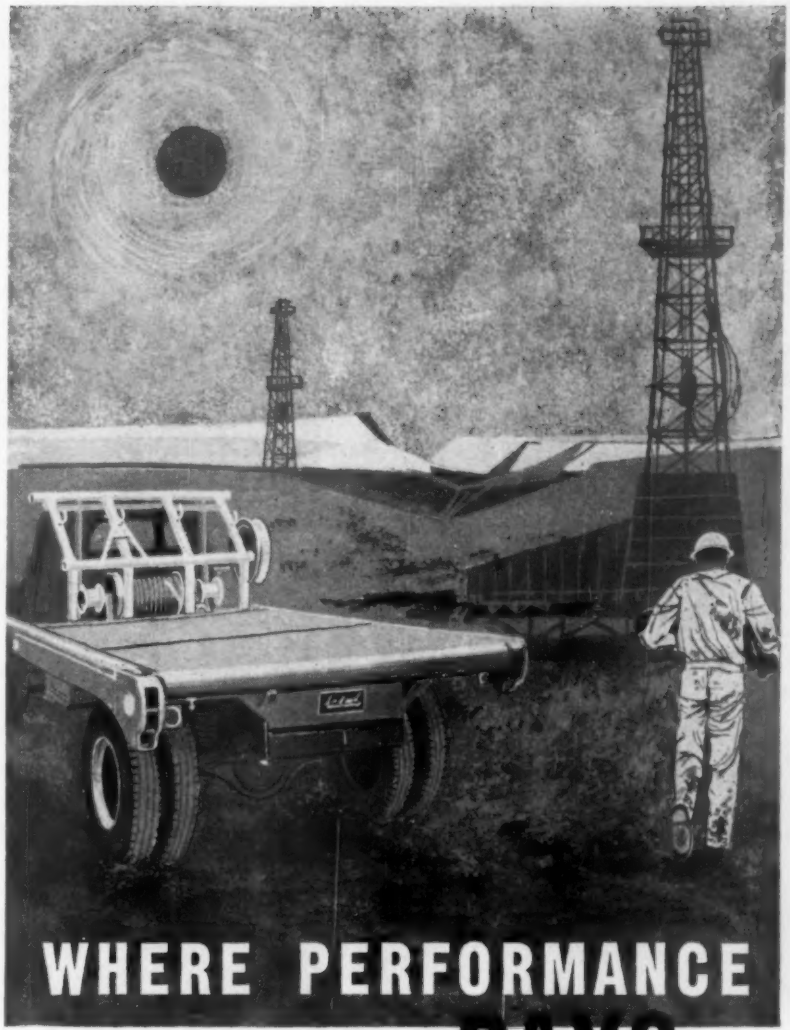
broken vegetational alignments, and narrow bands of tonal change. They generally conform with the northeast structural grain of the basin. Local significant changes in the direction of fracture traces are associated with complex faulting over subsurface anticlinal belts.

Major tonal lineaments and persistent sharp vegetational alignments can be interpreted as fault lines particularly on the north and west sides of the basin where complex faulting is evident from surface mapping and seismic information. The major structural feature of the northern Cook Inlet basin is the Castle Mountain fault zone. The fault zone is mapable on the outcrop in the northeast part of the basin. The zone trends southwestward along the northern perimeter of the basin as evidenced by isolated granite knobs of Jurassic age that protrude from the alluvium and glacial deposits on the upthrown side of major faults. Well-defined lineaments (Fig. 3) trace and extend the fault zone over many miles of alluvium and till cover where no stratigraphic displacement is visible.

Photogeomorphic map. The finished product of a photogeomorphic study, as in any geologic investigation, is a map comprising at least all of the four geomorphic elements discussed in this text. The map is a particular type of photogeologic map wherein geomorphological principles are stressed in order to show how earth materials are related to structural movement.

Fig. 6 is a simplified photogeomorphic map of the Tyonek area on the western side of the Cook Inlet basin. A recent state competitive lease sale covering 59,000 acres in the Tyonek area commanded wide attention when the bonus bid per acre averaged $123. Specific 640-acre tracts were leased for over $900 per acre, an assumingly unprecedented amount considering very little is known about the subsurface Tertiary stratigraphy on the western side of the basin. Seismic information, which prompted the high bidding, obviously indicated that favorable structural conditions exist.

The glacial overburden in the map area has been stripped along major consequent stream valleys. Moderately steep-dipping coal-bearing sands and shales of the Tertiary-



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Kenai formation are exposed. Small surface anticlines are revealed in a few localities along the river valleys, but their surface extent and persistence with depth cannot be determined by field mapping. The photogeomorphic map suggests that the small surface anticlines at "1" and "2" may be part of a well-developed subsurface anticlinal trend with several highs superimposed on a regional upwarp.

Most of the area is moraine covered. The best-drained ridges support heavy forest growth and the poorly drained kettles are covered by muskeg and swamp grass. Glaciation has been recent and much of the drainage is depositionally controlled. The geomorphic anomalies at "A" through "H" are not sharply defined, but structural control is substantiated by the change in orientation of fracture pattern and fault lines from the normal northeast direction to northwest and west. The west-trending fault lines and fracture traces may indicate movement transverse to the long axis of the anticlinal belt. Transverse faulting is characteristic of most of the known subsurface anticlines in the basin.

The geomorphic anomalies do not necessarily reflect the size or shape of the postulated subsurface structural highs but, rather, the outline of the anomalies drainage area. Anomalies "J" and "K" are considered depositionally controlled.

Conclusions to be drawn from any photogeomorphic map should be generalized and regionally applicable. The two important conclusions which are readily apparent on the photogeomorphic map are: (1) the presence of a north-trending regional upwarp, and (2) the occurrence of complex east-west (transverse) faulting associated with the upwarp.

A good photogeomorphic study depends on the skill and ability of the photo interpreter and his knowledge of the regional geology in detail including stratigraphy, structure, and paleogeology. Little credence is to be placed on a photogeomorphic report when thorough knowledge of the regional geology is obviously lacking.

Ideally, photogeomorphology may indicate where more detailed exploratory efforts, e.g., geophysical operations, should best be concentrated to gain adequate subsurface

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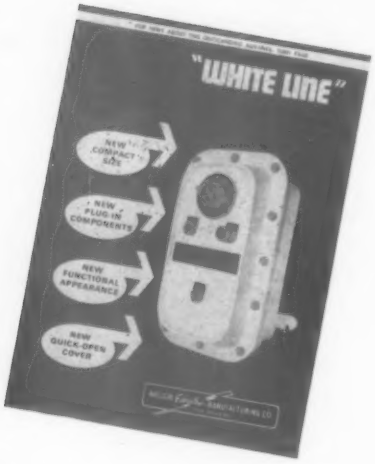

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Alberta oil hunting sets fast pace

REEF EXPLORATION is on the upswing in the Buffalo Lake-Bashaw area in Alberta's central fairway. Four wildcats are already drilling with two more planned soon. Present wells are centered at Buffalo Lake, 10-15 miles north of important D3 zone of Devonian oil reserves at Erskine. The other wells are reportedly north of the current wildcats.

Several factors. Three drilling reservations in the area are up for sale by the Alberta government November 23-December 5.

As most of the leases in this particular area—70 miles southeast of Edmonton and 140 miles northeast of Calgary—were taken out during the extensive Alberta Plains oil play in the early 50's, 10-year leases are running out. Thus it is drill and evaluate now, release, or re-lease.

Some of the major acreage holders are drilling while others are participating in the present play through land contributions. Either way the fast evaluation of a sizable spread of acreage is under way. The area has been a hot spot for geophysical exploration in the past number of months and as soon as further preliminary exploration of this type is completed by one operator definite drilling plans will be announced.

Buffalo Lake. California Standard Co. is drilling a pair of tests here. Tenneco Oil Co. recently began drilling at a wildcat here, and Imperial Oil Ltd. is drilling north of Nevis gas field D3 zone near Buffalo Lake.

The first test in this current play was Tenneco Oil Co. 1-A Buffalo Lake,, LSD 11, 13-41-21w4. This test will try for production down

to and including the Cooking Lake at 6,000 ft. Contractor is Cactus Drilling Corp. The well is a tight hole. Location is 8 miles northeast of D3 zone gassers in Nevis field and 9½ miles north of Hunt Oil Co.'s recent D3 oil strike south of Buffalo Lake. The well is on the north shore of the lake with the spread of exploration rights contained in Drilling Reservation No. 903, lying between the wildcat and Nevis field.

Cal-Standard's pair of wildcats are near the reservation available at the first of the two sales. Most southerly of this firm's current wells, 14-34 Buffalo Lake, LSD 14, 34-40-21w4, is 4 miles northeast of Nevis gas wells and is 7 miles due north of Hunt's oil well. The other test, 1-15 Buffalo Lake, LSD 1, 15-41-21w4, is 1¾ miles southeast of the Tenneco Oil Co. driller and 12 miles southeast of Bashaw field oil production. Can-Tex Drilling Co. is contractor for the 14-34 miles southeast of Bashaw field oil production. Can-Tex Drilling Co. is contractor for the 14-34 and Parker is drilling 1-15. Both wells are tight holes. Project depth at the wells is 6,800 ft. or Elk Point.

Imperial staked the fourth well in the area at 4-32 Nevis, LSD 4, 32-40-21w4, is only 2¾ miles northeast of Nevis field, but is classed as a wildcat. Commonwealth Drilling Co. is drilling this one on behalf of Imperial. The Imperial well is 2½ miles southwest of Cal-Standard's southern wildcat and offsets acreage contained in DR No. 903. Imperial will drill this well to about 6,215 ft. to test Cooking Lake.

Others planned. It is known that other tests are planned in the immediate area. Canadian Oil Companies, Ltd., is expected to drill one, Conwest Exploration the other. British-American-held oil rights as well as other Canadian independent operator-acreage is included in both agreements.

One stipulation of the November 23 drilling reservation sale, which offers rights within Buffalo Lake, requires the posting of a $200,000 bond before the spudding of any well on lands in the waters of the lake itself. This factor could tend to limit bidding on Parcel No. 903 to the majors or large independents.

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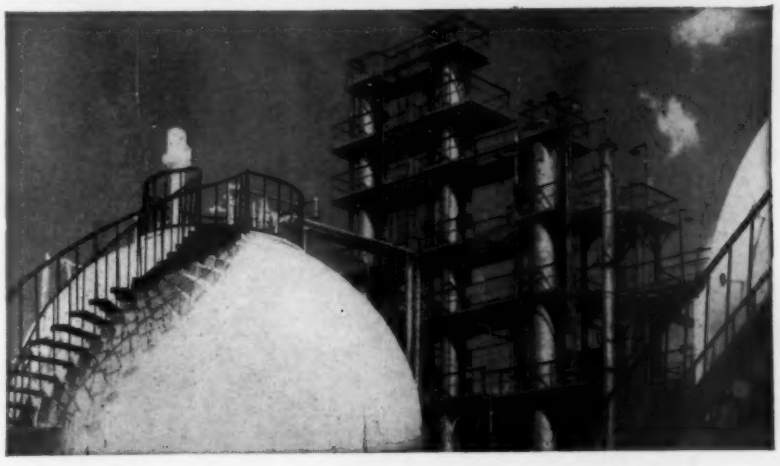

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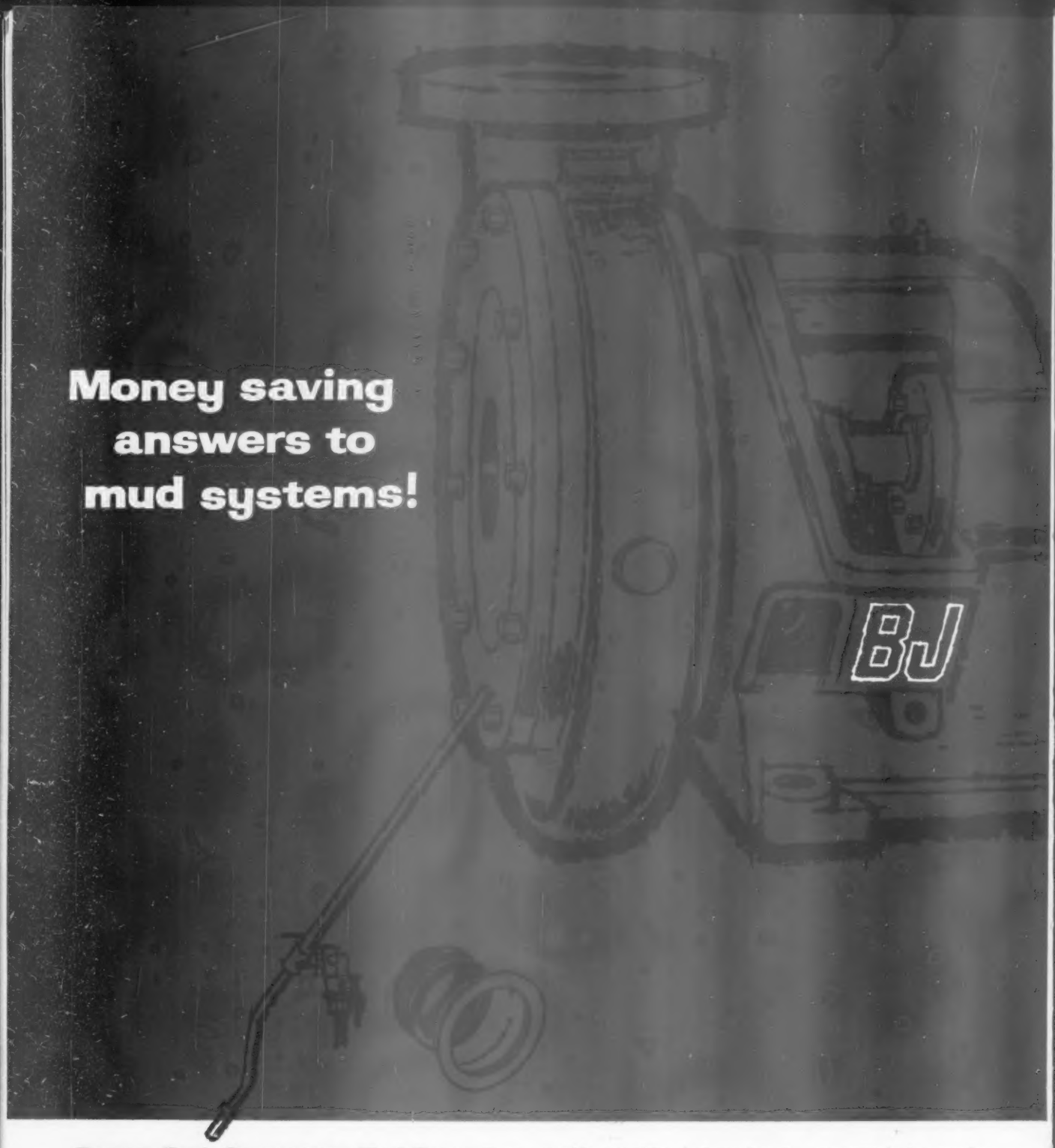

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Mesa County, Colorado, wildcat flows gas from Corcoran

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New Kansas fields get names

THE following new fields were named by the Kansas Nomenclature Committee at the October meeting. There were seven new oil pools named, one gas discovery.

Finney County: Kisner pool was opened at Pan American Petroleum Corp. 1 Kisner Gas unit "C" in NW SE 36-26s-33w, 15 miles south of Garden City. This discovery is a Morrow producer with testing still under way at 4,995-97 ft. Location of descriptive area is all of 36-26s-33w.

Graham County: Northwest Red Line oil pool is a new area covering the S½ 19 and N½ 30-9s-22w. The discovery well, 8 miles southeast of Hill City, is John O. Farmer 1 Farrell in C SW SE 19-9s-22w. Production is from Lansing at 3,795-3,845 ft.

Hodgeman County: Hanston oil pool was opened at Sunray Mid-Continent Oil Co. 1 Miller estate in SW NE 8-22s-22w, 7 miles northeast of Jetmore. This is pumping oil from Mississippi. Description is 8-22s-22w.

McPherson County: East Graber oil pool was opened at Charles Johnson 1 Unrum, OWWO, NW NW NE 15-21s-1w, 5 miles northeast of Moundridge. Completion was for 25 bbl. of oil and 10 bbl. water per day from Hunton Siluro-Devonian at 3,404-10 ft.

Reno County: Southwest Sterling oil pool was opened at Mull Drilling Co. 1 Morgan in C NE SW 17-

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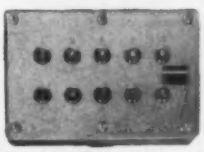

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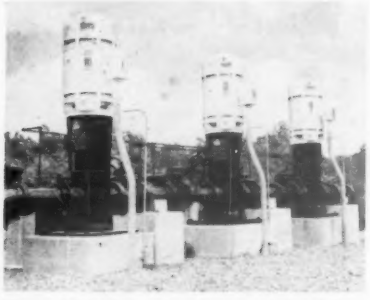

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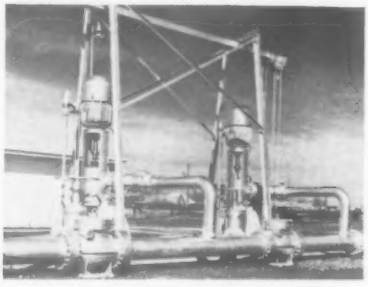

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22s-8w, 7 miles west of Nickerson. Completion was for 141 bbl. of oil daily from perforations at 3,544-54 ft. in the conglomerate. Description is all of 17-22s-8w.

Rice County: Tobias oil pool was opened at Thunderbird Drilling Co. 1 Tobias in NE NW SW 25-20s-9w, 4½ miles southwest of Lyons. Final testing is due with Arbuckle Cambro-Ordovician as pay. Description is W½ 25-20s-9w.

Stafford County: Southeast Leiss oil pool was opened at Dunne-Gardner 1 R. Russell in NW SW NW 25-25s-13w. The well is pumping oil from Lansing Pennsylvanian. Location is 9½ miles southeast of St. John. Description is W½ NW 25 and E½ NE 26-25s-13w.

Stevens County: West Perrill gas pool was opened at Pan American 1 Hahn Gas unit "C" in SE NW 6-31s-8w, 14 miles northwest of Hugoton. Completion was 975 M.c.f.d. from Morrow perforations at 5,655-57 ft. Description is all 6-31s-38w.

New Mexico yielding prolific Pennsylvanian pay

An important Pennsylvanian producing area is building up in Southeast New Mexico. Drilling continues below 13,688 ft. at Pan American Petroleum Corp. 1 Mary Nellis-Federal in C SW SE 5-19s-33e.

The well flowed up to 2,410 M.c.f.d. from perforations in the Morrow Pennsylvanian at 13,403-26 ft. This wildcat is also a Bone Springs oil prospect at 9,129 ft.

El Paso Natural Gas Co. has a dual-zone discovery 7 miles southeast in C NW NW 21-19s-34e at the 1 Mescalero Ridge unit wildcat. Flow was 933 bbl. of oil per day on ⅜-in. choke from Bone Springs perforations at 10,118-34 ft. and 1,300 M.c.f.d. from Morrow at 13,328-13,505 ft. The Morrow also had 47 bbl. of condensate per day. El Paso is also going to test for a dual completion at 3 Lusk Deep unit federal in C N½ SW NW 20-19s-32e. Production appears assured in the Strawn oil zone and in the Morrow gas zone. It would be the third Strawn oil well and the second Morrow gas well in the field. Perforations are at 11,310-40 and 12,370-90 ft., respectively.

Deep Lusk unit confirmation well finaled in New Mexico

The confirmation well to Lusk Deep unit in southwestern Lea County, Southeast New Mexico, was completed dually from Morrow and Strawn.

This important well is El Paso Natural Gas Co. 3 Lusk Deep unit, 13 miles south of Maljamar in 20-19s-32e. The well flowed 285 bbl. of oil from Strawn Pennsylvanian perforations at 11,310-40 ft. on 10/64-in. choke. It made 30 M.M. c.f.d., natural, from Morrow Pennsylvanian perforations at 12,370-90 ft. Location is ¼ mile southeast of a Bone Spring and Strawn discovery ¾ mile southeast of a Morrow and Strawn well.

Small pool indicated in Lorain County, Ohio

In Ohio, indications of a small pool opener in central Eaton Township, Lorain County, has been reported by Ohio Fuel Gas Co. on completion of 1 Friedman Land Development, Lot 44. Natural gage in the Clinton sand at 2,560-84 ft. was 55 M.c.f.d. and after fracture 252 M.c.f.d. Twenty-four-hour rock pressure was 935 psi.

In northeastern Ohio, a Medina test has been announced by Bert Fields in Somerset Township, Belmont County. Location of this rank wildcat is on 1 A. M. Doudna, Section 12.

Atlas Exploration Corp. has started a test about 6 miles southwest of the oil play in Morrow County. The target is the Trempeleau on 1 Art Denzer, Lot 4, Waldo Township, Marion County.

October multiple completions hit 246

	Dual	Triple	Quad.	—Total new reservoirs— Oil	Gas	Total
California	2	3	...	10	3	13
Kansas	12	...	...	18	6	24
Louisiana	50	8	...	84	40	124
North	11	5	...	16	21	37
South	30	2	...	47	19	66
Offshore	9	1	...	21	...	21
Mississippi	2	...	...	2	2	4
New Mexico	5	1	...	7	6	13
Oklahoma	62	17	...	137	38	175
Texas	70	10	1	118	56	174
Dist. 1	1	...	...	...	2	2
Dist. 2	5	...	1	6	8	14
Dist. 3	2	3	...	10	3	13
Dist. 4	17	3	...	20	23	43
East	6	2	...	17	1	18
Dist. 7-B	3	...	...	5	1	6
West	25	2	...	50	6	56
Dist. 9	7	...	...	10	4	14
Dist. 10	4	...	...	...	8	8
Utah	1	...	...	...	2	2
Wyoming	2	...	...	...	4	4
Total October	206	39	1	376	157	533

Total multiples 246.

Union Furnace pool gains another producer

In Ohio, another good producer was hit on a ¼-mile northwest step-out from production in Union Furnace pool in Washington Township, Hocking County.

Bristol Hackbusch reported the 1 Samuel A. Griffith, Section 21, had the Clinton sand from 2,694 to 2,721 ft. with a showing of oil and gas natural. In a 24-hour test 5 days after fracture it made 100 bbl. of oil per day with an estimated gas flow of 100 M.c.f.d.

Mississippian oil discovery flows in Shackelford County, Texas

Completion of a Mississippian discovery in a workover well is reported in Shackelford County Regular field, North Texas. The well is Wayne Petroleum Co. et al. 1 B. V. Midkiff et al.

The well, 6½ miles northeast of Moran, flowed 240 bbl. per day on 24/64-in. choke from Mississippian lime perforations at 4,264-80 and 4,288-96 ft. Location is in Section 6, B&H Survey.

Dual completion opens new North Texas discovery area

Dual completion in Conglomerate and Ellenburger is reported at a wildcat in southwestern Montague County, North Texas. The discovery well is Bridwell Oil Co. 1 R. B. Mansfield, 4½ miles northwest of Crafton and 2 miles east of Bowie Southwest field in G. W. Mansfield Survey, A-1622.

The well flowed 202 bbl. daily on 16/64-in. choke from perforations in the Conglomerate at 5,805-15 ft.; from Ellenburger at 6,798-6,810 ft. it flowed 157 bbl. per day on 16/64-in. choke.

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Fusselman Silurian find completed in West Texas

A Crane County wildcat in West Texas was completed flowing 386 bbl. of oil per day on 20/64-in. choke from Fusselman at 5,186-96 ft. The wildcat is Bell Petroleum Co. 1 Mobil-Glenn.

This new field is 7 miles northeast of Imperial in southern Crane County. Location is in Section 20, Block 1, H&TC Survey, ½ mile northwest of Siluro-Montoya production.

New West Texas Petroleum Review published by Phifer

Petroleum Review of Crockett County, Texas, a new statistical review of a West Texas area, is available from Phifer Petroleum Publications, Box 6014, Houston. This factual presentation is one of many such coverages of West Texas counties. All field data on Crockett County is presented in this 1961 review. Reviews of other West Texas counties are also available from Phifer.

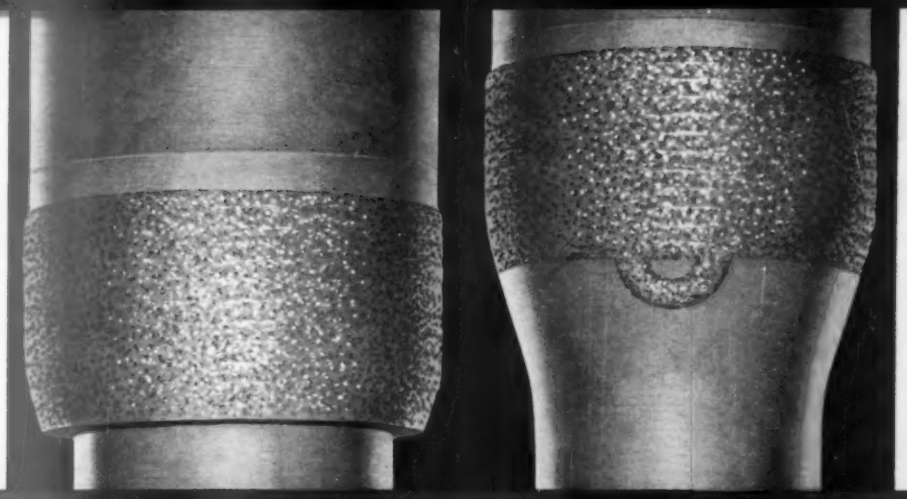
Wolfcamp is new pay in Warfield area, Texas

Warfield Multipay field in Midland County, West Texas, added Wolfcamp Permian production to its roster. The well is Texaco Inc. 2 Fletcher Curry, 11 miles southwest of Midland in Section 29, Block 40, T-2-S, T&P Survey.

The well, a triple producer, flowed 118 bbl. of oil from Wolfcamp Permian perforations at 9,443-92 ft. Flow was on 32/64-in. choke. From Devonian perforations at 11,-944-12,006 ft., the well made 88 bbl. of oil per day plus 29% water on 47/64-in. choke; from Pennsylvaanian at 10,530-38 ft. the well flowed 201 bbl. per day on 18/64-in. choke.

North Puckett grows. The second and third producers in this new Delaware basin gas giant were completed in west-central Pecos County.

Hassie Hunt Trust 2 Dow Puckett, ½ mile southwest of the discovery well in the field, flowed 74 M.M.c.f.d. from perforations at 10,-050-10,130 ft. in Ellenburger Cambro-Ordovician. This well is in Section 1, Block 100, EL&RR Survey.



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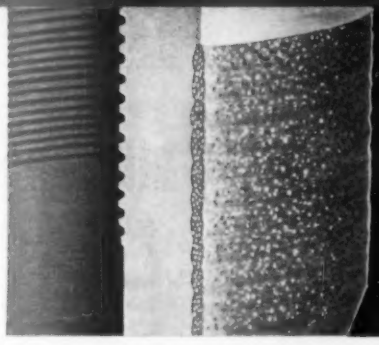

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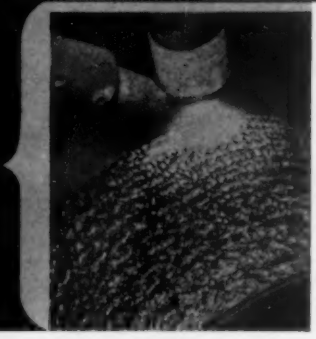

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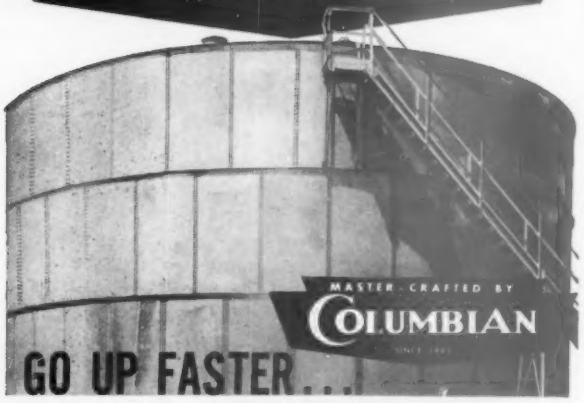

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The 1 Fred Nutt, 1 mile northeast of the field opener, flowed 59 M.c.f.d. from perforations at 10,195-10,275 ft. Location is Section 1, Block 180½, TC&RR Survey, 26 miles southeast of Fort Stockton. The field discovery well was Hunt Trust 2 Wimberly.

New Palo Duro basin fields adds extension

New Kirkland Cisco Pennsylvanian reef field in Childress County, Texas, has its third well and an east extension. O. P. Leonard completed 3-A V. Perkins, 6 miles west of Goodlet, flowing 186 bbl. of oil on 16/64-in. choke.

Production is from open hole in the reef at 4,600-7 ft. Location is in Section 382, Block H, W&NW Survey.

Texas Panhandle. In Ochiltree County, Shamrock Oil & Gas Corp. 1 Mary T. Morrison et al. is shut in after flowing 8,540 M.c.f.d. from Morrow Pennsylvanian perforations at 10,357-10,521 ft. Location is 2 miles west of Notla Morrow field and 22 miles southeast of Perryton. Spot is in Section 125, Block 43, H&TC Survey.

Important new field confirmed in West Texas

The second Ellenburger well in a newly opened Strawn and Ellenburger field in Upton County, 2 miles northeast of Rankin, West Texas, flowed 276 bbl. of oil in 24 hours on potential test through ½-in. choke. It is Liedtke '61 et al. 1 Colter in Section 29, D&MRR Survey, A-4, Certificate 412.

This north offset discovery flowed from open hole section at 11,005-11,135 ft. The discovery well of the field, completed 2 weeks ago, was Blue Danube Oil Co. 1 Neal.

Gaines County. Texaco Inc. completed the second well in a new Strawn field at North Champmon, southeastern Gains County, 14 miles east of Seminole.

The 1-B N. B. Birge, southeast offset to the 1 Birge discovery, flowed 282 bbl. of oil daily on potential test through 14/64-in. choke. Production is from Strawn at 11,188 ft. Location is in Section 1, Block C-43, PSL Survey.

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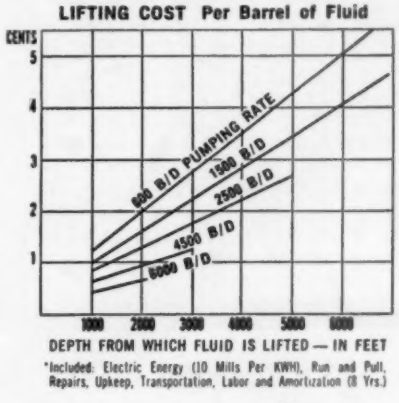

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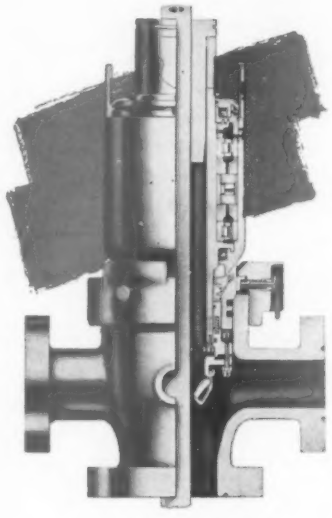

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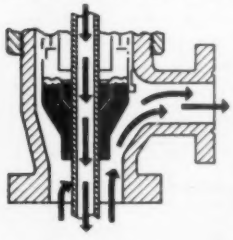

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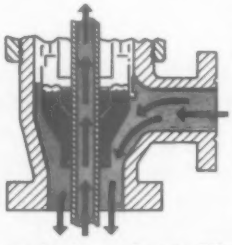

This is another of the modern drilling techniques that provides important advantages in certain formations Because the cuttings are returned through the inside of the drill string, higher fluid velocities are obtained at lower pump pressures (therefore lower pressures on the formations). Higher velocities lift larger cuttings, reduce need for coring, save costly rig time. Also, since larger cuttings are carried away faster, bit life is lengthened, drilling speed is increased.
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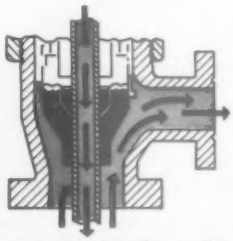

If yours are the more conventional drilling procedures, you still can do the job more efficiently and safely with a Shaffer Rotating Blowout Preventer and Stripper because this unit *automatically* adjusts itself to fit the varying diameters in the drill string without any attention from the operator. And even such abnormally large diameter drill string units as bits, reamers, and scrapers, can be readily passed through the Rotating Blowout Preventer without delay or inconvenience!

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New map available on U. S. basins, uplifts

A new map compiled by Dr. E. A. Riggs of the University of Illinois, entitled "Major Basins and Structural Features of the United States," is available from C. S. Hammond & Co., Maplewood, New Jersey. This map gives a good look at the producing and nonproducing basins and uplifts of the country and is a handy addition to geologic libraries.

West Texas' Terrell adds deep dual find

An important deep dual discovery was completed in northern Terrell County, West Texas. The new field opener is Roden Oil Co. 1 L. H. Hicks, 15 miles southeast of Sheffield.

The well flowed 4,200 M.c.f.d. from perforations in the Atoka Pennsylvanian at 11,492-12,072 ft. From Fusselman Silurian at 12,844-76 ft., the well flowed 4,050 M.c.f.d. Location is in Section 5, CCSD& RGNG Survey, 7½ miles north of Brown-Bassett field.

Ward confirmation. T. F. Hodge 2 Ana L. Herring, southeast side of South Pyote field in Ward County, was completed from 6,100-6,200 ft. The well, second producer in the 6,200-ft. zone of the field and fifth producer in the 6,100-ft. pay, flowed 145 bbl. of 39.5°-gravity oil plus 12% water per day. Flow was on 20/64-in. choke. Location is 6 miles south of Pyote in Section 94, Block 34, H&TC Survey.

New fields named in Oklahoma by nomenclature committee

Four oil fields and three gas fields were named at the recent nomenclature committee meeting in Tulsa.

Southwest Corn field was opened by Union Texas Natural Gas Co. 1 Edna Roberts, an oil find in C SE NW 10-9n-3w, Cleveland County; Northwest Pleasant Hill field was opened by Sunray at 1 Hladik, an oil find in C SW NW 32-20n-6w, Garfield County; North McCurtain field was opened at LeFlore County Gas & Electric Co. 1 O. Gross, a gasser in SE SE NW 2-8n-22e, LeFlore County; Southwest Shady Grove gas field was opened at Bell Oil & Gas Co. 1 Warren in C NE 9-6n-11e, Hughes County; Northwest Braman was opened as an oil pool in C NE NE 36-29n-2w, Kay County, by Apache Oil Corp. at 1 State "A"; Northwest Excelsior gas pool was opened by Big Chief Drilling Co. at 1 Hedgecock in C NW SE 22-19n-5w, Kingfisher County; Northeast Antelope oil pool, a 1956 discovery, was opened in SW SW NW 5-22n-2w, Noble County, by L. L. Cowden 1 Wade.

The committee also combined production in West Prairie Center and Southeast Salt Fork fields under one name of Southeast Salt Fork in 24n-3w, 25n-3w, and 25n-4w, Garfield County, northern Oklahoma.

Big pump gage reported at deep Elk Basin well

The deep discovery at Elk Basin field in the Big Horn basin of Wyoming pumped 695 bbl. of oil, cut less than 1½ of 1% basic sediment from Big Horn Ordovician perforations between 5,744 and 5,941 ft. This well is Pan American Petro-

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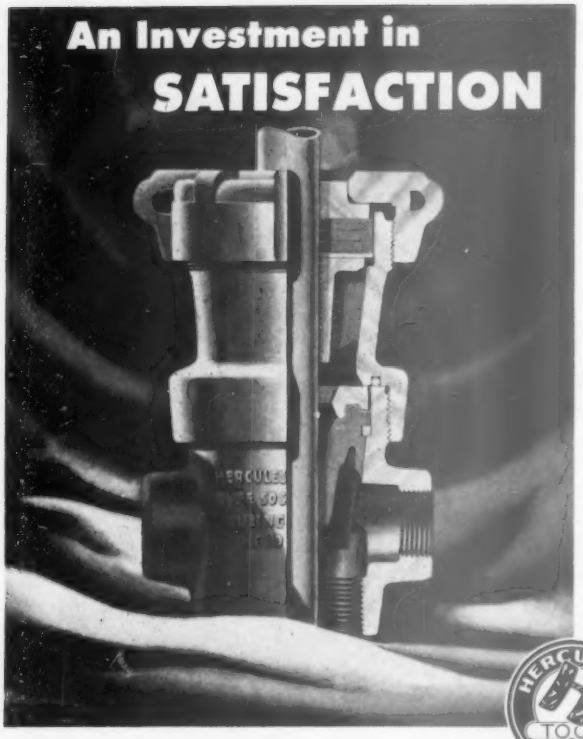

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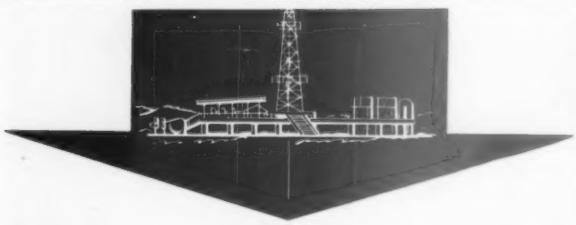

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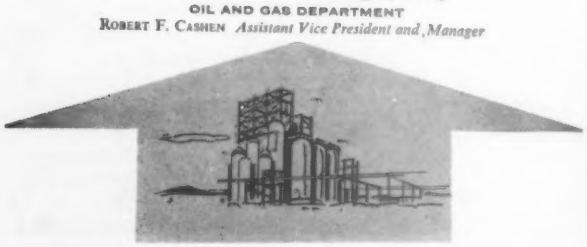

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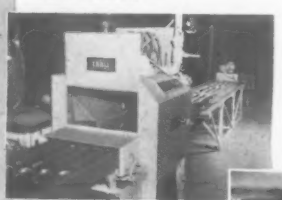

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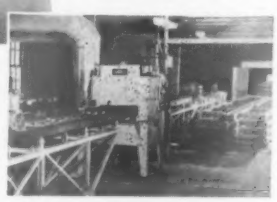

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leum Corp. 189 Unit on Lot 5, 19-58n-99w, Park County.

An earlier test of the formation flowed up to 20 bbl. of oil per hour. Pump has obtained more than 450 bbl. of oil per day on tests of Devonian perforations at 5,478-5,510 ft. The latest test in this pay recovered 132 bbl. of oil in 6 hours. Testing continues on pump.

Alberta adds new oil pool

ANOTHER major oil pool has been indicated in the general Fenn-Big Valley district of Central Alberta. If infill drilling continues to prove successful, a field at least 5 miles in length has been uncovered.

The indicated trend lies a few miles to the west of Fenn-Big Valley field which was discovered in 1950 by the same firm responsible for the new trend. British American Oil Co., Ltd., through the drilling of a pair of wells 5 miles apart, found D2 oil production in both and completed both with substantial initial potentials. The area between the two was previously untested but a recent stepout to the most southeasterly of the original discovery wells has indicated that it extends at least 1½ miles in the direction of the other strike.

Offsets. Two other ventures have been drilled successfully as offset to the most southeasterly strike, B.A.-CPR 14-33-35-20 Shaw Fenn, on LSD 14, 33-35-20w4, and British American is currently drilling another almost midway between the two, ⅜ mile northwest of the most northwesterly of the pair at the north end of the indicated 5-mile trend. That venture is B.A.-CPR-Kerbes 13-19-36-20 Fenn and was drilled on LSD 13, 19-36-20w4.

The Shaw discovery was completed in the D2 horizon from 24 ft. of pay section which was encountered around the 5,620-ft. level for 220 bbl. per day through restricted choke. The Kerbes well flowed 277 bbl. of oil daily from a 22-ft. pay sector at 5,501 ft.

The more recent stepout success in the district was drilled by United Producing Co. and Carl E. Siegesmund on lands acquired under farmout agreement from British American. Located 1½ miles northwest of

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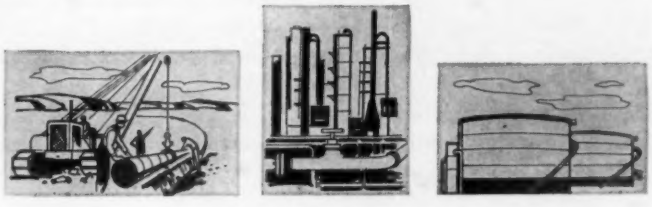

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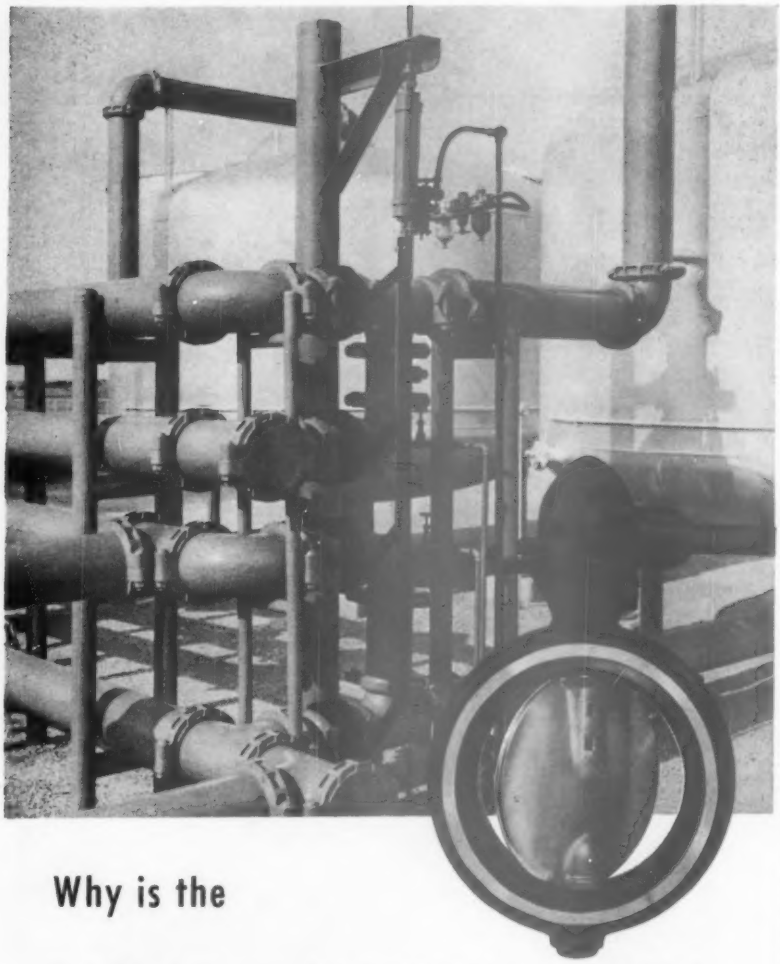

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the Shaw hole and 3½ miles southeast of the Kerbes strike, the well found the D2 horizon some 21 ft. higher than the elevation at which it was encountered at the 14-33 Shaw discovery and has, therefore, almost 45 ft. of pay zone. During drill-stem test water-free crude flowed at the rate of 10 bbl. per hour. Subsequently the well has been completed from a 13-ft. perforated interval below 5,577 ft. and rated with a potential of 252 bbl. of 35°-gravity crude.

Gas is also playing a big part in the development and exploration of this particular trend. The United Producing venture also found Viking gas at rate as high as 4 M.M.c.f.d. during drill-stem test while another current test—British American's stepout 1½ miles to the north of the United Producing hole found gas in the Glauconitic flowing at maximum rate 6,200 M.c.f.d.

Like most of the Fenn-Big Valley field developed by British American (at the time Canadian Gulf Oil Co., Ltd.) the more recent discovery wells and current drillers are on lands acquired under a large farmout agreement negotiated many years ago from the Canadian Pacific Railway. That company holds royalty on the lands and production from them.

Mississippi discovery completed by pumping

A SMALL pumping producer has been completed as the discovery well of a new Lower Cretaceous field in southeastern Hinds County, South Mississippi.

Completion is by Olin Oil & Gas Corp. in a hole drilled by Texas Pacific Coal & Oil Co. The latter drilled the well on a farmout from Olin.

The discovery is on the operator's Walter Wolfe lease in 26-3n-2w. It is 2 miles south of Morgans, for which the field is being named. It is about 15 miles southwest of Jackson.

Production is from the first Rodessa sand with perforations at 13,008-42 ft. Total depth is 14,556 ft. On the pump, the well is making 62 bbl. of 47°-gravity oil and 20 bbl. of water daily. Pumping primarily is for agitation with the well producing through 16/64-in. choke under

back pressure of 35 psi. Estimated gas-oil ratio is 200 cu. ft. per bbl.

There has been no other production within 15 miles. Nearest field is the old abandoned Jackson gas area. Nearest Lower Cretaceous production is at Bolton, nearly 20 miles north.

Gas pool discovered in Sacramento Valley

A new pool discovery has been made in South Sutter gas field of California's Sacramento Valley.

Atlantic Oil Co., Los Angeles independent, has completed its 3 Sutter Gas unit N in 35-15n-2e, Sutter County, flowing at a rate of approximately 2 M.M.c.f.d. Production is from selected intervals between 5,385-5,508 ft. in the Upper Cretaceous F zone.

The new pool is about 2 miles southeast of the South Sutter discovery well, which was brought in by Atlantic in August (OGJ, Aug. 28, p. 139). Another recent gas discovery, Grimes Bypass field, is 2¼ miles southwest of the N-3 pool discovery.

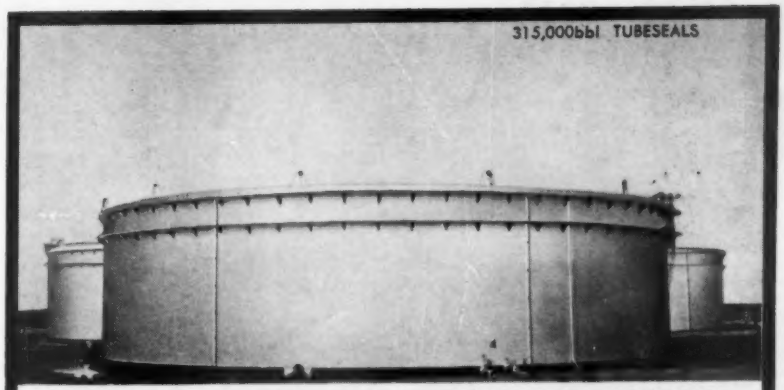
South Texas well taps deep gas pay

Deep Wilcox gas production has been opened at another wildcat location on the Lopena - Northeast Thompsonville trend extending along the Zapata-Starr county line in far-South Texas.

The new discovery by Michael T. Halbouty is 2½ miles east of Escoba field, long productive from shallow Mirando sands and more recently from Yegua and Queen City sands at depths to 6,000 ft.

Nearest deep Wilcox production is Gulf Oil Corp.'s discovery well, 1 Hector Vela, 7 miles northeast near the Starr County line. It was completed last February with pay at 13,372-13,282 ft.

Halbouty's well (1-B Lauro Garga) is productive from perforations at 10,784-94 ft. and 10,800-15 ft. Its absolute open-flow potential is 43 M.M.c.f.d. of gas. Shut-in pressure is 8,125 psi. It tested flows ranging from 3,869 M.c.f.d. through 9/64-in. choke with pressure of 7,651 psi. to 6,248 M.c.f.d. through 12/64-in. choke with pressure of 7,252 psi.



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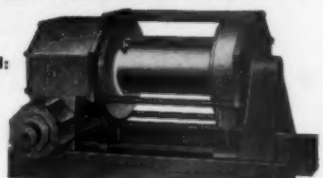

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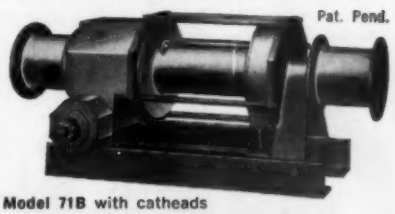

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One new oil pool discovered in Illinois in October

One new oil pool, Berry in Sangamon County, was discovered in Illinois in October. The discovery well is the 1 Waters drilled by James F. Waters in 32-15n-3w about 1½ miles north of production in Edinburg West pool. Reported initial production was 12 bbl. of oil a day from Silurian lime.

There also were seven extensions to oil pools, as follows: one each to Covington South in Wayne County, Edinburg West in Sangamon County, New Harmony Consolidated in White County, Oakley in Macon County, Omaha in Gallatin County, Patoka South in Marion County, and Wilberton in Fayette County.

A total of 202 new oil and gas tests was completed in October. The new tests resulted in 84 oil wells and 1 gas well. In addition, five wells that previously had been completed as dry holes were reworked or deepened and recompleted as producing oil wells.

One of the more interesting wells reported completed in October is the 12 Fee well drilled by T. G. Jenkins in Goldengate Consolidated pool in 29-2s-9e, Wayne County. The well was drilled to a total depth of 5,381 ft. and completed for an initial production of 320 bbl. of oil flowing through a ⅛-in. choke from the Dutch Creek sandstone which was topped at a depth of 5,338 ft. This well is ⅜ of a mile north of the 1 Wood "A" recently completed by Collins Brothers et al. for an initial production of 272 bbl. of oil flowing through ⅛-in. choke from the Dutch Creek sandstone. Estimated production for Illinois in October is 6,661,000 bbl.

Two gas-discovery wells tested in Arkoma basin

Two new gas discoveries within 10 miles of each other are reported in Northwest Arkansas' portion of Arkoma basin. Both are in Franklin County.

One by Republic Natural Gas Co. is 1¼ miles northeast of Dahoma. It (1 McGee) tested 3,600 M.c.f.d. of gas, flowing through 36/64-in. choke from the lower Hale formation at 6,554-92 ft.

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The other by Humble Oil & Refining Co. is just southeast of Alix. This well, 1 Hembree unit, flowed 240 M.c.f.d. of gas before fracturing. Since then its Atoka pay at 5,178-86 ft. has been fractured. Further testing now is under way.

The latter discovery is slightly less than 3 miles southeast of Altus field. Republic's well is 2½ miles northwest of Peterpender field, which produces from that same pay.

Cherokee oil found at Texas Panhandle wildcat

A Cherokee oil discovery was reported in northeastern Roberts County, Texas Panhandle. The new well is Belch & Pinion 1 D. D. Payne, Section 162, Block 42, H&TC Survey, 14 miles west of Canadian, Tex.

A flowing potential of 297 bbl. of 44.5°-gravity oil was reported on 24/64-in. choke. Perforations were in the Cherokee Pennsylvanian at 9,427-55 ft. New field name will be South Parsell Cherokee "A" field.

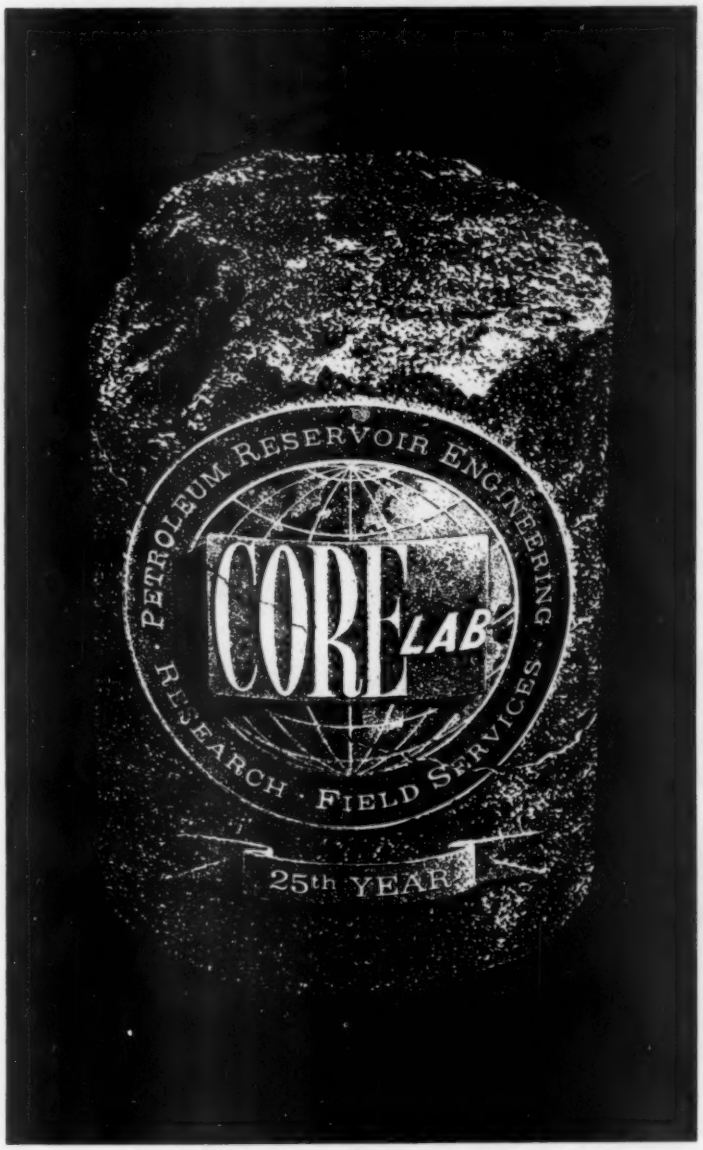
Flowing Devonian well finaled in West Texas

A flowing Devonian oil discovery was completed in northwestern Crane County, 8 miles east of Monahans in West Texas.

The new well is Gulf Oil Corp. 1-A Dorris Bryant in Section 20, Block B-18, PSL Survey, 2 miles northwest of Edwards Ranch field. Flow was 199 bbl. of 35.7°-gravity oil per day through ¼-in. choke plus 27 bbl. of water from perforations at 6,570-90 ft. Gas-oil ratio was 703:1. Gas volume was 140 M.c.f.d.

Key East Kentucky wildcat being drilled

In Mason County, eastern Kentucky, a key wildcat is being drilled by Oscar Brock at 1 H. A. Henderson. Test is located in 25-Z-68, 682 ft. north of the south line and 4,350 ft. east of the west line. Sample tops released to date include: Lexington lime (Ordovician) 355 ft., Tyrone lime 560 ft., Knox dolomite 1,060 ft. Total depth is 1,065 ft. with a hole full of water. Operators may drill deeper to test the Rose Run sand.



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Another test staked by Shell in Nevada

Shell Oil Co. is continuing to press its hunt for more oil in Nevada despite another dry hole, its ninth in 13 completions.

The company has staked location for the 45-5 Eagle Springs unit in 5-7n-57e, Nye County. The location is about a mile west of the 54-4 Eagle Springs unit, which was plugged late last month at 7,485 ft.

The 45-5 will be about 7 miles southwest of Eagle Springs field, which has four completions in 35-9n-57e. Shell is producing about 450 bbl. daily from three of the four producers in the field.

DISCOVERIES

California

Sutter County:

Atlantic Oil Co. 3 Sutter gas unit N, NE SE SW 35-15n-2e, 2 miles southeast of South Sutter gas field. Flower 2,000 M.c.f.d. from Upper Cretaceous F zone from selected intervals between 5,285-5,508 ft. TD 6,500 ft. New pool discovery.

Western Canada

Alberta:

Canpet 8-12 Shepard, LSD 8, 12-23-29w4. Cardium sand oil discovery. TD 5,330 ft.

Supertest C IG 10-3 Tent Lake, LSD 10, 36-65-13w4. Colony gas discovery. TD 1,715 ft.

Texaco-Texacan 14-33 Pembina, LSD 14, 33-50-10w5. Cardium sand oil discovery. TD 5,190 ft.

Zapata et al. 11-7 Leahurst, LSD 11, 7-40-18w4. Basal quartz gas discovery. TD 4,335 ft.

Hamilton-Pan American 10-30 Birch Lake, LSD 10, 30-50-11w4. Viking gas discovery. TD 2,602 ft.

British Columbia:

Hudson's Bay B-27-F Cypress, 27-F-94B-15. Triassic and Permo-Penn gas discovery. TD 9,135 ft.

Pacific et al. a-4-D North Beg, a-4-D-94-G-8. Triassic gas discovery. TD 5,607 ft.

Saskatchewan:

Colorado 10-17 Smiley, LSD 10, 17-32-25w3. Viking gas discovery. TD 2,543 ft.

Husky C7-36 East Marshal, LSD 7, 36-48-26w3. Sparky gas discovery. TD 1,791 ft.

Colorado

Logan County:

Stuarco Oil Co. 1 Fehringer, C NW SE 34-12n-52w. IPP 110 BOPD, 50% water, "D" sand 5,076-80 ft. TD 5,264 ft. "D" sand discovery, new field.

Mesa County:

Ambassador Oil Corp. 1 Federal-Colorado-C, NE SW 35-9s-99w. IPF 4,540 M.c.f.d., 6,320-33 ft. 1¼-in. choke, IPF 6,222-35 ft. 778 M.c.f.d.. 1-in. choke, Dakota 6,222-6,333 ft. TD 7,009 ft. Dakota discovery, new field.

Morgan County:

Kimbark Exploration Co. et al. 1 Price-State, C SE NW 18-4n-59w. IPF 500 M.c.f.d., 18/64-in. choke, TP 200 psi., "D" sand 6,120-25 ft. TD 6,259 ft. "D" sand discovery, new field.

Rio Blanco County, Piceance Creek:

Mobil 68-11 Piceance unit, SW SE 11-2s-97w. IPF 5,150 M.c.f.d., 14.7 bbl. cond. per day, 59°, CP 1,350 psi., TP 876 psi., ½-in. choke, Wasatch Tertiary 5,185-5,270 ft. TD 7,751 ft. Wasatch discovery, new pay.

Kansas

Greenwood County:

Triple "A" Drilling Co. 1 Huffine, 17 miles southeast of Eureka in SW SE NW 10-28s-13e. IPF 1 M.M.c.f.d., Burgess and Mississippian open hole 1,300-

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Stephens, Arkansas—Ph. ST 6-5487
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B-H Pump Service, Selman City, Tex. Ph. 5-2035
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6 ft. TD 1,313 ft. PB 1,306 ft. New gas discovery.

Pratt County:

Continental Oil Co. 1 Brehm, 3 miles south of Pratt in SW SE SW 23-28s-13w. IPF 205 BOPD, no water, 18/64-in. choke, FTP 1,160 psi., 33° Arbuckle 4,423-33 ft. TD 4,547 ft. New oil discovery.

Rice County:

Pure Oil Co. 1 Smisor Trust "A," C SE NE 13-21s-8w, 8 miles northeast of Sterling. IPF 1,930 M.c.f.d., 13/64-in. choke, CP 625 psi., TP 600 psi., Miss. 3,362-69 ft. TD 3,414 ft. PB 3,393 ft. New gas discovery.

Thunderbird Drilling, Inc. 1 Faler, 6 miles southwest of Lyons in SE NW NE 2-21s-9w. IPP 76 BOPD, 42.5°, Simpson 3,322-37 ft. TD 3,395 ft. New oil discovery.

Seward County:

Pan American Petroleum Corp. 1 Hille gas unit "B," C NW SE 3-32s-33w. IPP 95 BOPD, 35°, Chester sand 5,813-15 ft. TD 6,493 ft. New oil discovery.

Stafford County:

Ferguson Oil Co. 1 Spangenberg, 6 miles northeast of St. John in SW SW NE 4-23s-12w. IPP 19 BOPD, Viola 3,627-37 ft. TD 3,749 ft. New oil discovery.

Stevens County:

Cities Service Petroleum Co. 1 Skinner "C," C SW NE 16-34s-35w, 11½ miles southeast of Hugoton. IPOF 2,150 M.c.f.d., SIP 1,398 psi., Chester 6,180-6,259 ft. TD 6,710 ft. New gas discovery.

North Louisiana

Concordia Parish:

McGoldrick & Watson Drilling Co. 1-B Fisher, C SW SE SE 21-6n-7e. IP 89 BO in 12 hours, 10/64-in., 42°, TP 100 psi., perf. 5,913-15 ft. and 5,917-20 ft., Wilcox. TD 6,010 ft. Extends Kincaid Bayou field 1¼ miles northeast.

LaSalle Parish:

Hunt Oil Co. H-151 La. Delta, C NE SE 2-5n-3e. IP 122 BOPD, 10/64-in., 45.4°, TP 460 psi., GOR 500 cu. ft. per bbl., perf. 4,630-32 ft., Wilcox. TD 5,211 ft. Extends Sandy Bayou field 1 mile northwest.

Bodcaw Co. 15 Bodcaw Fee-LLS, C NE NE 17-8n-2e. IP 18 BOPD (net), 4% b.s. and w., 16/64-in., 22°, perf. 1,909-11 ft., Wilcox. TD 4,301 ft. New-pool discovery 1¾ miles southwest of Searcy field, and 2¼ miles east of Little Bayou field.

Sabine Parish:

Bill Gary et al. 1 Bray C NW NW NE 32-6n-12w. IP 88 BOPD, 13/64-in., TP 300 psi., perf. 3,130-40 ft., Sara sand. TD 3,436 ft. Extends Pendleton field 2 miles east.

Winn Parish:

Kinsey Interest M-1-2 Urania, 1-10n-1w. IPP 59 BOPD, 21°, perf. 1,370¾-72¾ ft., Wilcox. TD 1,501 ft. Discovery well of Pope Creek field—1½ miles northeast of Curry.

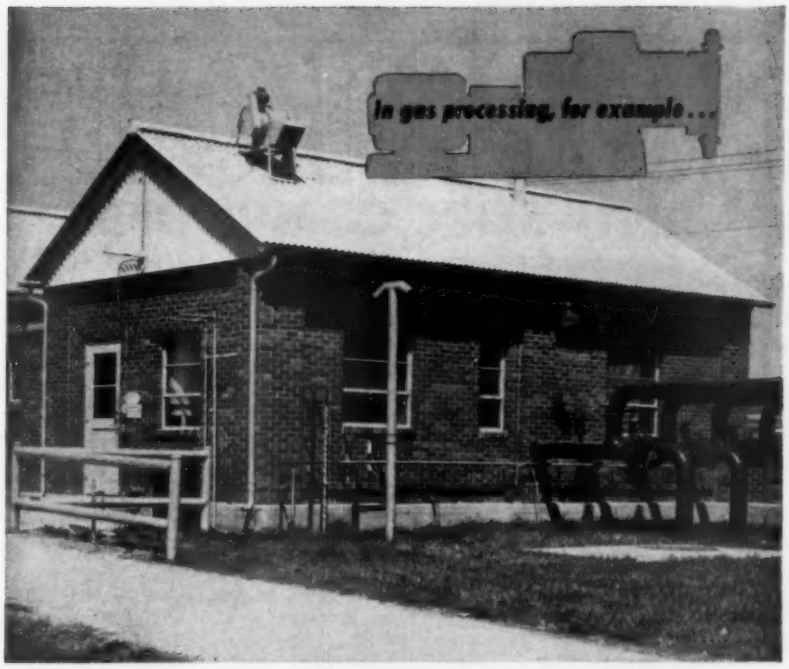
South Louisiana

Acadia Parish:

Charles B. Wrightsman 1 Hulin, 18-10s-2e. IP 38 BOPD and 2,910 M.c.f.d., 12/64-in., 51°, TP 3,575 psi., perf. 9,964-90 ft. TD 12,367 ft. Extends South Rayne field 1¼ miles northwest and new pay.

Rapides Parish:

Bateman Drilling Co. 1 Freeman, 1-1n-1w. IP 30 BOPD (net) 60% b.s. and w., open choke, 43°, perf. 9,727-34 ft. TD 9,800 ft. New-field discovery—old dry hole reentered.



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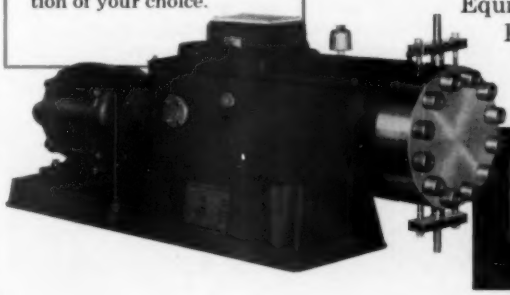

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Nebraska

Hitchcock County:

Texaco Inc. 1 Hedke, SW NE 31-1n-33w. IPP 98 BO, 42 BWPD, Lansing-Kansas City 4,021-4,119 ft. TD 4,815 ft Lansing-Kansas City discovery, new field.

New Mexico

Lea County:

Gulf Oil Corp. 1 Levi Harris, 8 miles northwest of Hobbs in 21-17s-38e. IPF 164 BOPD, 20/64-in. choke, TP 275 psi., CP packer, 10,001-10,116 ft. TD 12,565 ft. New oil discovery.

San Juan County:

Roy Owen 1 Donella, SE SE 3-29n-15w. IPF 64 BOPD, Gallup discovery, new pool, Gallup 4,300-14 ft. TD 4,494 ft.

Sunray 1 Amargis, C SW NW 33-30n-15w. IPF 16½ BOPD, CP 620 psi., Gallup 4,060-4,232 ft. TD 4,330 ft. Gallup discovery, new field.

John H. Trigg 1-3 Federal, NE NE 3-25n-10w. IPP 36 BOPD, Gallup discovery, new field. Gallup 5,989-6,008 ft. TD 6,750 ft.

Illinois

Clay County:

Black & Black Oil Co. 1 H. C. Skelton, NE SE SW 17-2n-7e. IPP 25 BOPD, Rosiclare 3,106-12 ft. TD 3,200 ft. New oil discovery.

Franklin County:

D. O. Ross 1 Arrie Garragus, SE SE 6-7s-3e. IPP 2 BOPD, 17 BWPD, O'Hara 2,801-22 ft. TD 2,942 ft. New oil discovery.

St. Clair County:

Wm. H. Krohn 1 Mueller, SE NW NW 20-2s-7w. IPF 630 M.c.f.d., Cypress 242-54 ft. TD 254 ft. New gas discovery.

Ohio

Lorain County:

Ohio Fuel Gas Co. 1 Friedman Land Development, Lot 44, Eaton Twp. IPF 252 M.c.f.d., IRP 935 psi., Clinton 2,560-84 ft. TD 2,606 ft. New gas discovery.

Oklahoma

Beaver County, Mocane-Laverne gas area:

Mid-American Minerals 1 Phelps, C SE NW 29-4n-23eCM, IPP 60 BO 15 hours, upper Morrow and lower Morrow 6,601-6,896 ft., 6,601-20 ft. and 6,896-42 ft. IPF 10,800 M.c.f.d., lower Morrow. SITP 1,746 psi. TD 7,142 ft. New oil discovery, gas extension, and dual completion.

Blaine County:

Texaco Inc. 1 Swanegan, C SE NE 11-16n-11w, 4 miles northeast of Watonga. IPF 5,400 M.c.f.d. Cherokee Penn. 9,030-77 ft. 62 BCPD, 12/64-in. choke, FTP 5,610 psi., SITP 6,200 psi., GOR 87,000:1, 56°. TD 9,395 ft. Gas-condensate discovery.

Hughes County:

Bell Oil & Gas Co. 1 Warren, C NE 9-6n-11e, 4 miles northeast of North Hilltop field. IPF 2,084 M.c.f.d., ¾-in. choke, Hartshorne 3,042-58½ ft. TD 3,113 ft. FTP 200 psi., SITP 660 psi. New gas discovery.

Kingfisher County:

Powell Briscoe, Inc. 1 J. M. Vaverka, 1¼ miles north of Southeast College Corner pool in C NE NE 30-19n-5w. IPF 24 BO/4 hours, 16/64-in. choke, FTP 100 psi., Oswego and Meremac commingled. 6,030-38 open hole at 6,428-6,553 ft. TD 6,553 ft. New oil discovery.

East Texas

Smith County:

Humble Oil & Refining Co. 3 E. A. Wendlandt, Jose M. Acosta Sur., 9 miles northwest of Bullard. IPP 25 BOPD, 26.4°, GOR 36 cu. ft. per

bbl., perf. 8,046-54 ft., Paluxy. TD 12,621 ft. First production on Brooks salt dome.

Van Zandt County:

Pan American Petroleum Corp. 1 Parker, William Hart Sur., A-242, 1 mile southwest of Edgewood. IP 19,600 M.c.f.d., calculated open-flow potential, 133 BC per M.M.c.f., 55.8°, perf. 12,834-12,900 ft., Smackover. TD 13,704 ft. Discovery well of Edgewood field.

North Texas

Montague County:

Bridwell Oil Co. 1 R. B. Mansfield, 2 miles east of Bowie in G. W. Mansfield Sur., A-1622. IPAOF 1,900 M.c.f.d., SITP 1,664 psi., 60°, GOR 110,000:1, Caddo Penn. 5,643-58 ft.; IPF 202 BOPD, 16/64-in. choke, TP 1,300 psi., CP packer, 41°, GOR 1,100:1, conglomerate 5,805-15 ft.; IPF 157 BOPD, 16/64-in. choke, TP 1,100 psi., CP packer, 41°, GOR 900:1, Ellenburger 6,798-6,810 ft. TD 6,855 ft. Triple oil and gas discovery.

Throckmorton County:

Currey Oil Co. 2 Atkinson, 5 miles southeast of Throckmorton in Section 1, TTRR Sur. A-877. IPF 259 BO in 16 hours, plus 40 min. through 10/64-in. choke, 41°, GOR 750:1, CP 655 psi. TD 4,674 ft. New oil discovery.

Wilbarger County:

Nye & Roberts Oil Co. 1 W. T. Waggoner estate. "E," 4 miles southwest of Harrold, deep test surrounded by shallow Regular field production. IPP 96 BOPD, 40°, GOR 250:1, Canyon sand 3,158-66 ft. TD 3,314 ft. New oil discovery.

Texas Gulf Coast

Colorado County:

Crescent Oil & Gas Corp. 17-A Brownson, E. S. Wooly Sur., A-584, 15 miles west of Garwood. IP 121 BOPD, 10/64-in., 45°, TP 425 psi., GOR 824 cu. ft. per bbl., perf. 5,814-19 ft. TD 6,200 ft. Oil discovery in Northwest Garwood field.

Jefferson County:

Tynes & Claypool 2 Gilbert estate, Sarah Miles Sur., A-172, 2½ miles northwest of Fannett. Absolute open-flow potential 77 M.M.c.f.d., GLR 31 M.c.f. per bbl., 53.9°, shut-in TP 3,243 psi., perf. 8,726-36 ft., Hackberry. TD 8,985 ft. New-field discovery.

West Texas

Coke County:

Tucker Drilling Co. 1 Mary G. Hays, 8 miles northwest of Robert Lee in Robert McRea Sur. 1596. IPF 143 BOPD, 43°, GOR 1,153-:1, 14/64-in. choke, 5,001-5 ft. TD 6,300 ft. New oil discovery.

Concho County:

Lon H. Cron 2 Byrdie H. Cox, 11 miles northwest of Eden in Sec. 28, Blk. 9, H&TC Sur. IPF 312 BOPD, 36.5°, GOR 599:1, TP 325 psi., packer. TD 3,965 ft. New oil discovery.

Luling Oil & Gas Co. 2 Maud Houston, 2 miles southeast of Paint Rock in Peter Bock Sur. 288. IPF 91 BOPD, 24/64-in. choke, 43.4°, GOR 210:1, TP 60 psi., CP 380 psi. 3,475-80 ft. TD 3,773 ft. New oil discovery.

Crane County:

Bell Petroleum Co. 4 Mobil-Glenn, 7 miles northeast of Imperial in Sec. 20, Blk. 1, H&TC Sur. IPF 386 BOPD, 20/64-in. choke, 40.6°, GOR 966:1, TP 1,100 psi., CP packer, Fusselman Silurian 5,186-96 ft. TD 5,397 ft. New oil discovery.

Garza County:

J. E. Blakey, Jr. 1 A. D. Justice, 4 miles southeast of Justiceburg in Sec. 3, Blk. 6, H&GN Sur. IPP 84 BOPD plus 20% water, 35.8°, open hole San Andres Permian 2,020 ft. TD 2,103 ft. New oil discovery.

Midland County:

Texaco Inc. 2 F. Curry, Warfield field, Sec. 29, Blk. 40, T-2-S, 11 miles southwest of Midland. IPF 201 BOPD, 18/64-in. choke, 42.6°, GOR 2,583:1, TP 100 psi., CP packer, Penn. 10,539-38 ft.; IPF 88 BOPD plus 29% water, 47/64-in. choke, 49.2°, GOR 9,273:1, TP 100 psi., CP 600 psi., Devonian 11,933-12,006 ft.; IPF 119 BOPD, plus 23% water, 32/64-in. choke, 33.7°, GOR 3,213:1, TP 50 psi., CP packer, Wolfcamp Permian 9,443-92 ft. Triple zone oil discovery.

Scurry County:

Fenix & Scisson, Inc. 1 Jennie Coffee, 2 miles northeast of Snyder in Sec. 121, Blk. 3, H&GN Sur. IPF 189 BOPD, 18/64-in. choke, 39°, GOR 600:1, TP 225 psi., CP packer, Strawn 7,157-72 ft. TD 7,900 ft. New oil discovery.

Upton County:

Blue Danube Oil Co. 1 H. F. Neil, 1½ miles northeast of Rankin in Sec. 26, Blk. B, HE&WT Sur. IPF 638 BOPD, 16/64-in. choke, 43.1°, GOR 1,915:1, TP 1,650 psi., CP packer, Strawn Pennsylvanian 9,336-42, 9,356-64, and 9,379-90 ft.; IPF 268 BOPD plus 17% water, 32/64-in. choke, 51.2°, GOR 523:1, TP 200 psi., CP packer. TD 11,268 ft. Dual zone oil discovery.

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PROFILE

CORTLANDT S. DIETLER

Young man with many interests

. . . is Cort Dietler, who's already done almost everything a man can do in the oil business and who's still moving.

CORTLANDT S. Dietler is a man who's tried nearly everything in the oil business except running a refinery.

You could call him a young man on the way up, except that many will tell you he already has it made. But to Cort Dietler, it isn't so; there is still an awful lot to be done.

Just turned 40, Dietler can already look back on an unusual career. He's been an office boy, a roustabout, an exploration manager, a drilling contractor, an independent operator who has drilled more than 50 wildcats. He's seen foreign oil service as a government-relations man, been a crude-oil buyer for a Canadian firm. But in most of these activities, he says, his success "wasn't anything to write home about."

He didn't really get to rolling until he struck out on his own—the last time—in 1953 with a Colorado partner, Jack Oleson, and formed a crude-oil buying and transporting company.

This little outfit, Western Crude Marketers, Inc., was started with only two trucks and less than $1,500, but it had assets of more than $9,000,000 this year when it was merged into Permian Corp.

And this doesn't tell the whole story. Outside the company, Dietler and Oleson have many other interests—ranging from a third interest in 50,000 acres in northern Alaska to a cattle ranch. Right now they're getting into LPG marketing.

Luck or work? What does it take to turn $1,500 into more than $9 million in only 8 years? "A lot of luck," says Dietler.

His friends disagree. Their answer: "Hard work." Says one: "If I need to talk to Cort on Sunday, I try the office first." Says another: "That guy just enjoys working." And Dietler confirms this.

There's no clue to his success in his college training. He graduated from Tulsa University with a major in history and political science. "I wasn't smart enough to study engineering," he contends.

His father pushed him in the direction of oil. Ralph O. Dietler, then president of Stanolind (now Indiana) Oil Purchasing Co., believed young Cort should be gainfully employed, so he got him a summer job at age 16 with British American Oil Co. Young Dietler spent five such summers, first as office boy, then later as a roustabout.

The war interrupted his college, but it let him see Africa and the Near East. What he saw prompted him to take a government-relations job with Trans-Arabian Pipe Line Co. in 1947 while the line was under construction. He quit before his contract expired, went to Casper as a crude-oil representative for Toronto Pipeline Co.—to buy U. S. crude for tank-car shipment to Saskatchewan refineries.

He left this job in mid-'49 to return to Tulsa with an interest in a contract-drilling firm. After a few months this lost its appeal and

---

L. L. Henning has been elected a director, vice president, and general manager of manufacturing for Standard Oil Co. of Kentucky.

George W. Caulkins, president of Merchants Oil Co., Denver, was elected president of National Oil Jobbers Council at the group's annual meeting last week in Chicago. He succeeds **E. K. Bennett,** Longview, Tex. Other new officers include **J. H. Williams** of Florida, vice president; and **Francis J. Schuster** of Indiana, secretary-treasurer.

Henry W. Grote, general manager of Universal Oil Products Co.'s research and development laboratories, has been elected president and a director of Trubek Laboratories, a subsidiary of UOP. **Robert A. Moody** will succeed Grote as general manager of laboratories.

Lamar McLennan, assistant chief geologist for Texaco, has been named assistant manager of the Houston division, domestic producing department.

Bob A. Whitney, geologist with Union Producing Co., has been named Lafayette, La., district geologist. **Claude D. Smith** has been named Jackson, Miss., district geologist.

he struck out with a partner and one rig.

It was then that oil was found in the Julesburg basin, and the pick-up in activity there caught Dietler's restless eye. So in 1950 he moved to Denver to try his hand at putting deals together.

Here he had some success, but when Argo Oil Corp. offered him a job early in 1951 as division exploration manager, he "reluctantly" took it. That autumn he formed, on the side, Platte Transport Corp. to haul crude oil for producers. He left Argo a year later to strike out as an independent operator. This activity, too, palled after a time, and in 1953 he joined Oleson in the effort which really put his career into high gear.

Their crude-oil buying and selling company found its opportunity in new areas. They would buy oil without a market, find a refiner who could use it, and then truck it to him.

In recent years, they've gambled on future prospects of new areas and have built pipelines where they thought the chances of growth were good. Today the firm operates five 3 to 6-in. pipelines.

It's harder today . . . Could a young man today repeat such a performance? "I don't think so," says Dietler. "It's harder to poor-boy an operation today," he says. Changes in the tax laws have made life tougher, and increasing government regulation works against growth, he says.

Some who know him say differently. They think Cort Dietler would wind up a success no matter what the obstacles. One thing is certain: he's still a demon for work and his interests are as broad as the oil industry. He still might own a refinery some day.

L. Hicklin has been named measurement engineer in the development department of Alberta Oil and Gas Conservation Board. He had been in the gas department.

William Franklin Matheny, Calgary chemical engineering consultant, has been named adviser to management on petrochemical development by Pacific Petroleums, Ltd.

Dr. A. J. Buselli, director of research for W. R. Grace & Co.'s polymer chemicals division, has joined Texas Butadiene & Chemical Corp. as vice president, research and development.

P. J. Golla has been promoted to senior chemical engineer in the distillation and finishing department at Humble's Baytown, Tex., refinery. He had been on rotational assignment as assistant general foreman of the lube-finishing department.

Walter N. McGuire, chairman of Associated Oil & Gas Co., has joined the board of Occidental Petroleum Corp., Los Angeles. McGuire is also senior partner in the Stamford, Conn., law firm of McGuire, Cole, & Bentley.

Orlin L. Norder has been named chief chemist at SunOlin Chemical Co.'s Claymont, Del., petrochemical complex. He will be responsible for operation of laboratories and quality control testing.

M. B. Taubman, Tulsa, is president of Buffco Petroleum Corp., new company organized in Denver. **E. E. Nowell** and **L. Claude Roark,** formerly with Buffalo Petroleum Corp., are vice presidents of Buffco.

Dr. J. D. Lindsay, head of the chemical engineering department at Texas A&M College, received the distinguished service award at the recent technical meeting of American Institute of Chemical Engineers, South Texas section. **J. C. Upchurch,** Union Carbide Chemicals Co., was named outstanding young member, and **Dr. D. R. Longmire,** Texas Butadiene & Chemical Corp., and **D. D. Roselius,** Humble, received publication awards.

Ralph L. Reynolds has been named general supervisor, hydrocarbons, at Monsanto Chemical Co.'s Chocolate Bayou refinery near Alvin, Tex. He had been process superintendent of the El Dorado, Ark., refinery. **P. E. McIntyre,** manager of rubber-chemicals development in Akron, Ohio, has been promoted to product director of rubber chemicals there. Also, **A. Bruce MacDonald** has joined Monsanto's L-M Oil Co. operations in Calgary as a petroleum engineer.

PERSONALS

Wilton E. Scott, senior vice president of Tenneco Oil Co., has been elected president and a director. He succeeds **Gardiner Symonds,** who had been serving on an interim basis as president and chairman of the firm. Symonds, chairman of Tennessee Gas Transmission Co., the parent company, will continue as Tenneco chairman. Scott entered the oil business with Standard Oil Co. (N. J.) in 1936. He later was with Cities Service Oil Co. and Buffalo Oil Co. He joined Tennessee Gas Transmission as exploration manager in 1955.

SCOTT

Ronald M. Craigmyle, president of Southwest Natural Gas Co., Shreveport, La., before its recent merger with Arkansas Louisiana Gas Co., has been elected a director of Arkansas Louisiana Gas.

W. A. Collins, Jr., has been named assistant director of Lone Star Gas Co.'s research and development department.

Thomas J. Hoff has retired as chief engineer at Badger Pipe Line Co.'s Peru and Middlebury, Ill., stations.

James V. Hooton, Humble, has been named secretary-treasurer of International Oil Scouts Association. He will serve the unexpired term of **Howard Palmer, Jr.,** who resigned.

Johnny O'Bryan, drilling foreman for Arabian American Oil Co. in Dhahran, Saudi Arabia, has joined Pan American International Oil Corp. as drilling foreman in Comodoro Rivadavia, Argentina.

Edward C. Woodall has been named Pampa, Tex., area superintendent for Pan American Petroleum Corp. He will succeed **Ralph Ludwick,** who is being transferred to the Pine Island area, Vivian, La., as superintendent. The change is effective December 1.

John R. Donnell, Ohio Oil Co. director and vice president of international operations, has been elected president and director of Marathon International Oil Co., new company organized to handle Ohio's international operations. **William E. Slaughter, Jr.,** president of Aurora Gasoline Co., has been named administrative vice president

DONNELL

SLAUGHTER

HENDERSON

LUTON

of Marathon International, and **P. L. Henderson,** Ohio's international production vice president and director, **R. E. Luton,** Ohio refining vice president and director, and **W. K. Tell,** Ohio general attorney, will be vice presidents of the new company. Slaughter, Henderson, Luton, and Tell will also serve as Marathon directors. Tell will be general attorney. Other officers of the new company are **G. R. Schoonmaker,** vice president of production and exploration; **R. M. Churchwell,** vice president of production operations; **E. A. Graham,** treasurer; **K. M. Burns,** controller; and **R. E. Rhea,** secretary. Headquarters of the subsidiary will be in Findlay, Ohio.

C. H. Ashley, Buffalo, N. Y., district manager for Mobil Oil Co., has been promoted to commercial manager in New York City.

Raymond J. Hunt, supervisor of market development in the U. S. and Canada for Standard Oil Co. (Ind.), has been named deputy coordinator of marketing. He succeeds **Clare R. Wolf,** who recently became executive vice president of Tuloma Gas Products, a subsidiary.

Troy W. Michie, senior engineer for Humble in Tulsa, has been promoted to district engineer in St. Elmo, Ill.

H. S. Row, formerly in the industrial chemicals division of Shell Chemical Co.'s Houston plant, has been named manager of the technical department of the Shell Point plant, Pittsburg, Calif.

Paul V. Troup, Jr., manager of marketing in American Oil Co.'s Indiana region, has been named regional manager in New Orleans. He succeeds **J. C. Rollins,** now district manager for Tennessee and Kentucky.

R. L. Ferris, Shell Oil Co.'s chief exploitation engineer in Houston, has been named Corpus Christi, Tex., division production manager. He succeeds **R. L. Gibson,** who has been named production superintendent.

J. Howard Casey has been appointed producing manager for Mobil International Oil Co.'s northern and southeastern Europe region. Casey had been vice president in charge of producing for Mobil Oil Co. de Venezuela.

Edward S. Cohen has been named section head in charge of petroleum production new methods research for Jersey Production Research Co., Tulsa. Cohen was with Esso Research & Engineering Co., an affiliate, before joining Jersey Production Research earlier this year.

Marvin Chandler, president of Northern Illinois Gas Co., has been elected chairman of the board of trustees of Institute of Gas Technology. He also will be chairman of the executive committee. Chandler succeeds **Everett H. Tollefson,** Consolidated Natural Gas Co., who will continue as a trustee and executive committee member. **William G. Hamilton, Jr.,** American Meter Co., was elected to the executive committee, and **Lester Armour,** Harris Trust & Savings Bank, was elected a trustee and executive committee member. Other new board members are **Jack V. Richards,** Public Service Gas & Electric Co., and **William P. Woods,** Washington Natural Gas Co.

David C. Davies, chief engineer for Home-Stake Production Co., Tulsa, has been named manager of the company's new exploration department. The department will coordinate and supervise evaluation and investigation of water-flood prospects. Davies had been with Tidewater Oil Co. and Salmon Oil Corp. before joining Home-Stake in 1957 as petroleum engineer. He became chief engineer last year.

Dr. Robert E. Helander has been promoted to senior research engineer at Union Oil Co.'s research center at Brea, Calif.

Donald M. Cox, coordinator of supply and transportation for Humble, has been assigned to Esso AG, German affiliate of Standard Oil Co. (N. J.). He is expected to be elected a director of the German company.

John Rush Vann, formerly with Richardson & Bass, has opened offices as petroleum engineering consultant in Fort Worth. He will specialize in property appraisal, recovery methods, management consultation, and general petroleum engineering.

Louis J. Meyer, Mount Pleasant, Mich., independent, has been elected 1962 president of Michigan Petroleum Landmen's Association. He succeeds **Glen Mapes,** Humble, Grand Rapids. Other new officers are **Carl Wender,** Sun Oil Co., Mount Pleasant, vice president; **Oscar Long,** Ohio Oil Co., Alma, treasurer; and **Willie Legg,** Ohio Oil, Jackson, secretary.

W. S. Frisbie, Falcon Seaboard Drilling Co., has been elected 1962 chairman of the Fort Worth-Dallas chapter of American Association of Oilwell Drilling Contractors. Frisbie will succeed **E. Dale Mount, Jr.,** Dale Mount Drilling, Inc., Dallas, on January 1. Other new officers are **N. E. Simes,** Penrod Drilling Co., Dallas, vice chairman; **Grover R. Simpson,** King-Phillips, Inc., Fort Worth, secretary; and **J. A. Kelly,** Reed Roller Bit Co., Dallas, associate secretary-treasurer.

Leo A. Castler, chief utility engineer for Socony Mobil Oil Co. in New York, has been promoted to chief process engineer in the design division of the engineering department. **Bernard A. Spielman,** project engineer, has been promoted to chief utility engineer. **E. E. Winters,** who has been manager of Mobil Oil Co.'s east Los Angeles sales district, has been transferred to New York as merchandising manager of Mobil's retail merchandising department.

Kenneth Moss has been promoted to area manager supervising rig operations in western Canada and Alaska for Reading & Bates Drilling Co., Ltd. He succeeds **Steve Shambaugh,** who has resigned to become president and managing director of Cascade Capital Corp., Spokane, Wash. Moss had been serving as drilling superintendent in charge of Alaskan operations. He has been with the company for 18 years. Shambaugh, active in Canadian industry associations, had served as president of Canadian Association of Oilwell Drilling Contractors and a director of Canadian Petroleum Association.

MOSS

Tom J. Sivley, Artesia, N. M., has been elected president of New Mexico Oil and Gas Association. **R. H. Morgan,** Hobbs, has been named vice president, and **Walter A. Shellsheer,** Roswell, has been elected treasurer.

Marcus J. Graham has been named manager of United Carbon Co.'s new Mojave, Calif., carbon-black plant.

William A. Sears, Signal Oil & Gas Co., has been elected president of Wyoming Geological Association. Other new officers are **William A. Brandorff,** Continental Oil Co., first vice president; **Arthur G. Randall,** independent operator, second vice president; **Richard C. Norman,** Gulf Oil Corp., secretary; and **Charles W. Crowson,** Forest Oil Corp., treasurer.

J. D. Hawsey, technical sales representative with Continental Oil Co., has been promoted to manager of oil-field sales for the petrochemical department. He will continue to headquarter in Midland, Tex. Hawsey succeeds **R. T. Means,** who has moved to Aurora, Ohio, as sales vice president for Carlon Products Co., a Continental affiliate.

James A. O'Neill, Jr., vice president of refining for Ingram Oil & Refining Co. before its merger with Murphy Corp., has been appointed deputy shareholder's representative for Murphy in Europe. He will headquarter in London and will assist **C. S. Snodgrass,** shareholder's representative and chairman of Murco Petroleum, Ltd., Murphy's operating company in the United Kingdom. O'Neill is expected to be nominated for director of Murco Petroleum and Svenska Murco Petroleum and Murco Transport Co., Murphy's other European operating companies.

L. P. Whorton, southwest research manager for Atlantic Refining Co., in Dallas, has been named president-elect of AIME's Society of Petroleum Engineers. He will step in as president of the SPE section in 1963. Whorton has also been elected a director of AIME for the coming year. **Richard A. Morse** will be installed as 1962 SPE president in February (OGJ, Oct. 23, p. 201).

WHORTON

William F. Blaze has joined Wico Oil Co., Oklahoma City, as assistant exploration manager of the western division in Sacramento, Calif.

Robert F. Meldau, research engineer with California Research Corp. in La Habra, Calif., has been transferred to Taft, Calif., as reservoir and secondary recovery engineer for Standard Oil Co. of California, Western Operations, Inc.

Gulf Interstate Engineering Co., Houston, has expanded its consulting staff. **John R. Giese** has been appointed chief consultant engineer, and **Paul Guarin** has become senior consultant engineer. Giese formerly was supervisor of economic studies for Great Lakes Pipe Line Co. at Kansas City, Mo. Guarin had been performing independent consulting engineering work for several major oil companies in South America, Middle East, and Far East for the past 7 years.

DEATHS

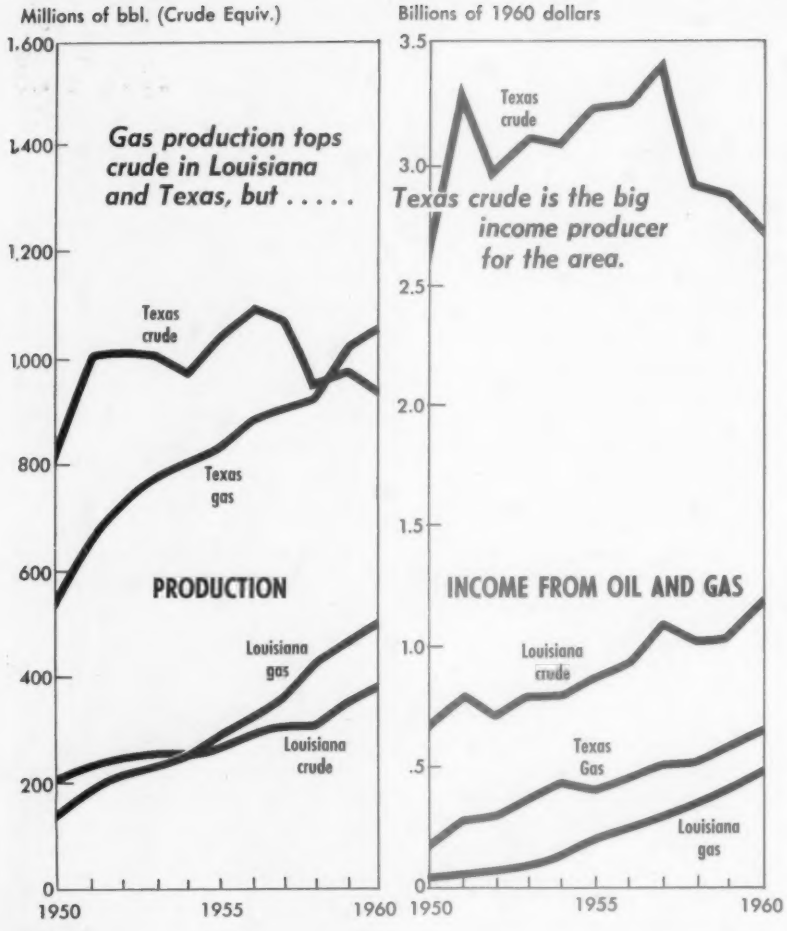
DeWitt Talmadge Finley, 84, retired Tulsa independent operator, died November 9 in a Tulsa hospital.

Samuel M. Gladney, 63, manager of Sun Oil Co.'s southwest production division, died November 11 in a Dallas hospital. He had suffered a heart attack 2 weeks before. Gladney had been with Sun since 1919 and had been southwest division manager and assistant secretary of the company since 1951. He was active in industry and civic organizations and was honored in 1955 as recipient of Texas Mid-Continent Oil and Gas Association's annual distinguished service award.

Jack McGee, 78, Los Angeles, formerly superintendent of equipment for Mobil Oil Co., died October 27.

R. J. Don Wallace, 72, Houston consulting engineer with the Clint Murchison interests, died November 3. Wallace was an independent operator in Tulsa before joining Republic Natural Gas Co. in Dallas before World War II. He resigned as a vice president of Republic in 1949 to join Transcontinental Gas Pipe Line Corp. in Houston as head of the gas-supply division. He had been with the Murchison interests since 1954.

H. W. (Bo) Bardsley, 66, secretary-treasurer of Remco Manufacturing Co. in Tulsa, died November 13 in a Tulsa hospital. Bardsley had been with Remco, manufacturer of specialized pipeline equipment, since 1952.



Gas supplies the energy, but crude brings in the cash

BY JOHN C. CASPER

LOUISIANA OPERATORS produced 35% more gas than crude last year. Crude production amounted to 394.4 million barrels, but gas production was equivalent to 532.3 million barrels of crude. The chart shows that Louisiana gas caught up with crude in 1954 and has been pulling away each year since that time.

Crude had a better lead in Texas at the start of the decade. Production for 1950 amounted to 830 million barrels, compared with gas output equivalent to 558 million barrels of crude. Crude topped the billion-barrel mark in 1951 and was above this level for 6 of the past 10 years.

There was a sharp drop in Texas production for 1958, and output for the year exceeded gas production only because gas showed the smallest gain of the decade. For the past 2 years, gas output in Texas has moved ahead of crude on an energy basis.

Gas Takes Lion's Share of Gain

Rapid expansion in production of natural gas in Texas and Louisiana has made it possible for gas to supply a large part of the gain in energy requirements over the past decade. Gas gains in these two states covered almost half of this country's increase in consumption of energy fuels during the fifties. Total energy consumption gained the equivalent of about 1.8 billion barrels of crude. Gains in marketed production of natural gas for Texas and Louisiana were equal to almost 880 million barrels.

Despite these volumetric gains, producer income from Texas and Louisiana gas is low compared with income from Texas crude. Sales of Texas crude averaged about 3 billion dollars per year during the fifties. (Values are stated in 1960 dollars.) Gas from both Louisiana and Texas averaged only 650 million dollars on the same basis.

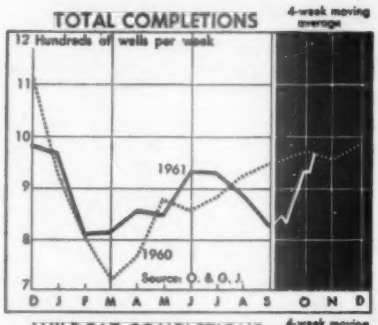
Total crude income for Texas and Louisiana averaged more than six times income from natural gas. The total energy volume is up, but low gas prices have reduced the average price of energy from these two states.

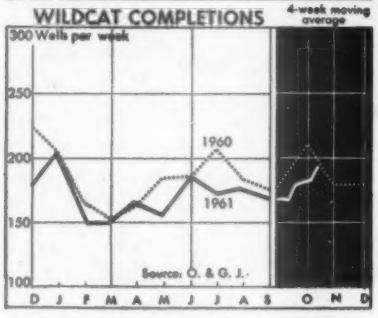
A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,171,310	UP	30,210	UP	41,717
Crude stocks	250,766,000	DOWN	382,000	UP	18,391,000
Completions	971	UP	42	DOWN	42
Refinery runs	8,079,000	UP	245,000	UP	362,000
Gasoline stocks	182,284,000	DOWN	*1,647,000	DOWN	778,000
Kerosine stocks	37,088,000	UP	39,000	UP	859,000
Distillate stocks	179,858,000	UP	858,000	UP	704,000
Residual stocks	49,523,000	UP	821,000	UP	799,000
Four-product stocks	448,753,000	UP	*71,000	UP	1,584,000
Total imports	1,850,000	UP	131,700	UP	107,900

*Data for 11-3-61 revised.

Active rotary rigs





	11-13-61	11-6-61	11-14-60
Alabama	6	6	3
Alaska	7	6	8
Arkansas	18	20	14
Arizona	3	3	2
California	99	106	67
Land	94	101	64
Offshore	5	5	3
Colorado	28	28	46
Florida	1	1	4
Land	0	0	2
Offshore	1	1	2
Georgia	0	0	2
Illinois	47	47	36
Indiana	11	8	12
Iowa	0	0	1
Kansas	116	106	122
Kentucky	4	7	6
Louisiana	279	277	282
North	43	48	33
S. Inland waters	105	106	100
S. Land	83	72	87
Offshore	48	51	62
Michigan	25	23	32
Mississippi	59	58	57
Missouri	2	2	2
Montana	26	30	18
Nebraska	25	27	20
Nevada	1	0	0
New Mexico	102	99	108
New York	2	2	2
North Dakota	15	13	12
Ohio	6	9	5
Oklahoma	205	198	190
Pennsylvania	5	6	5
South Dakota	1	1	1
Tennessee	1	0	0
Texas	650	673	650
S. Inland waters	12	13	12
S. Land	184	196	165
Offshore	1	1	2
North	62	60	43
Panhandle	47	46	61
East	71	69	59
West Central	165	169	177
West	108	119	131
Utah	40	42	28
Washington	0	0	1
West Virginia	13	12	8
Wisconsin	0	0	1
Wyoming	72	69	67
Total U. S.	**1,869**	1,879	1,812
Cum. avg. to date	1,734	1,732	1,735
Western Canada	146	138	151
Eastern Canada	1	1	0
Grand total	2,016	2,018	1,963

Hughes Tool Co. report.

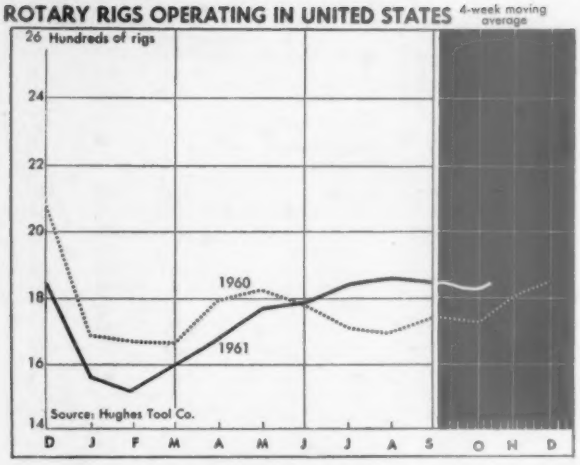
Weekly well completions . . . Week ended November 11, 1961

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Arkansas	9	1	0	1	7	0	31,010	442	528	4	0	0	0	4	95	132
California	57	43	0	3	11	0	199,286	1,583	1,470	6	0	0	0	6	235	266
Colorado	12	2	0	2	8	0	67,087	575	565	5	0	0	0	5	256	286
Illinois	37	11	0	0	26	0	70,115	1,776	2,011	15	0	0	0	15	406	431
Indiana	15	7	0	0	8	0	25,200	666	928	4	3	0	0	1	181	333
Kansas	66	31	0	2	32	1	243,995	4,155	3,502	16	4	0	0	12	765	907
Kentucky	28	7	0	1	19	1	34,484	1,610	1,816	7	1	0	0	6	116	192
Louisiana	90	40	0	6	44	0	575,525	3,326	3,136	24	2	0	0	22	563	488
North	50	14	0	3	33	0	170,006	1,411	1,212	18	2	0	0	16	274	234
South	33	22	0	2	9	0	330,165	1,452	1,495	6	0	0	0	6	240	224
Offshore	7	4	0	1	2	0	75,354	463	429	0	0	0	0	0	49	30
Michigan	22	6	0	3	9	4	66,059	693	819	4	0	0	1	3	247	225
Mississippi	14	4	3	0	7	0	117,086	479	592	2	0	0	0	2	171	229
Montana	14	7	0	0	7	0	88,364	345	298	4	0	0	0	4	162	140
Nebraska	24	8	0	0	16	0	121,749	851	769	14	0	0	0	14	424	335
New Mexico	35	13	0	9	13	0	146,298	1,582	1,620	8	0	0	0	8	263	224
West	16	2	0	9	5	0	72,147	688	581	5	0	0	0	5	88	63
East	19	11	0	0	8	0	74,151	894	1,039	3	0	0	0	3	175	161
North Dakota	8	6	0	0	2	0	44,225	225	254	1	0	0	0	1	61	70
Ohio	25	10	0	7	8	0	72,512	922	931	3	0	0	1	2	39	44
Oklahoma	106	57	1	11	31	6	444,576	5,010	4,025	10	2	0	1	7	466	618
Texas	341	191	1	33	109	7	1,553,155	12,482	13,561	64	8	0	5	51	2,678	2,779
Dist. 1	20	8	0	6	6	0	65,221	806	963	4	0	0	0	4	315	347
Dist. 2	21	6	0	5	10	0	128,001	654	659	5	0	0	1	4	196	164
Dist. 3	20	10	0	3	7	0	139,053	984	1,019	3	0	0	0	3	197	192
Dist. 4	39	17	0	6	15	1	198,237	1,072	934	18	1	0	3	14	299	260
East	22	15	1	0	6	0	133,760	1,005	1,136	4	0	0	0	4	262	230
Dist. 7-B	35	8	0	4	23	0	109,312	1,544	1,923	11	1	0	0	10	436	543
West	93	78	0	0	14	1	429,065	3,129	3,485	8	4	0	0	4	610	549
Dist. 9	69	39	0	3	22	5	207,615	2,276	2,530	7	2	0	0	5	250	442
Dist. 10	22	10	0	6	6	0	142,891	1,012	912	4	0	0	1	3	113	52
Utah	1	1	0	0	0	0	5,417	207	205	0	0	0	0	0	94	75
West Virginia	34	4	0	25	5	0	91,114	874	774	0	0	0	0	0	7	9
Wyoming	28	9	0	2	17	0	80,526	845	919	16	1	0	0	15	329	371
Miscellaneous*	5	0	0	1	4	0	7,733	1,221	1,184	5	0	0	1	4	242	214
Total U. S.	**971**	458	5	106	383	19	4,085,516	39,869	39,907	**212**	21	0	9	182	7,800	8,368
Previous week	929	405	2	104	360	58	3,902,792	.....	.....	205	18	2	11	174	.....	.....
Cum. 1961	39,869	17,882	713	4,096	14,485	2,693	162,367,839	.....	.....	7,800	690	81	355	6,674	.....	.....
Cum. 1960	39,907	18,008	1,152	3,347	15,142	2,258	164,796,607	.....	.....	8,368	758	92	281	7,237	.....	.....
Western Canada	75	42	0	16	17	0	435,667	1,994	1,966	15	2	0	4	9	467	515

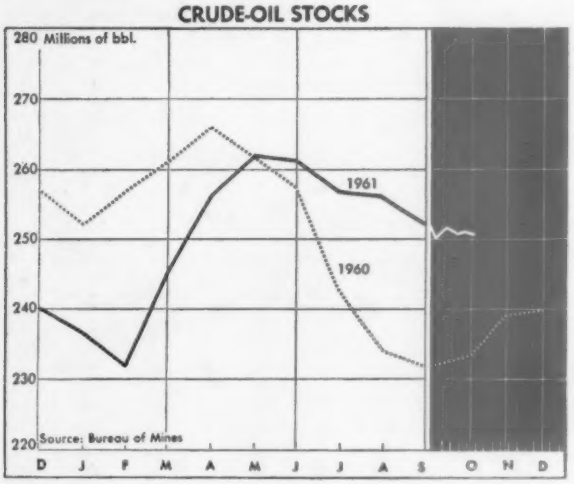
*Alaska, Tennessee.

Production

ROTARY RIGS OPERATING IN UNITED STATES 4-week moving average



CRUDE-OIL STOCKS



Crude-oil stocks by states of origin*

(Thousands of barrels)

	11-4-61	10-28-61	11-5-60
Pennsylvania	2,294	2,307	2,307
Other Appalachian	1,494	1,573	1,418
Illinois, Indiana, Michigan	9,909	9,622	8,980
Nebraska and North Dakota	2,968	3,046	2,838
Kansas	9,171	9,233	8,784
Oklahoma	17,018	16,791	15,346
Arkansas	1,745	1,696	1,918
Louisiana	20,419	19,702	18,007
North	3,083	3,093	3,066
South	17,336	16,609	14,941
Mississippi, Alabama, Florida	3,400	3,583	1,825
New Mexico	9,586	9,103	8,686
Texas	106,664	107,829	96,682
East Texas	8,269	8,015	7,381
West Texas	47,556	48,535	46,472
Texas Gulf	18,375	19,163	16,828
Other Texas	32,464	32,116	26,001
Wyoming	16,086	16,213	15,149
Other Rocky Mountain	10,046	10,281	9,792
California	23,724	24,009	26,073
Foreign	†16,242	16,160	14,570
Total	**250,766**	251,148	232,375

*Bureau of Mines. †Includes 4,465,000 bbl. in California.

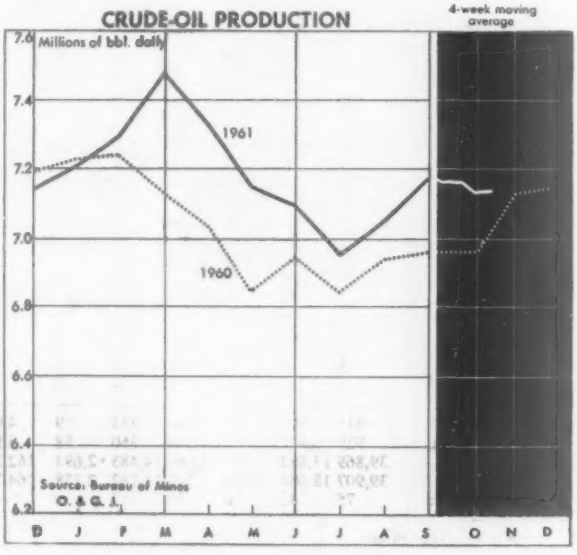
Daily average production for week

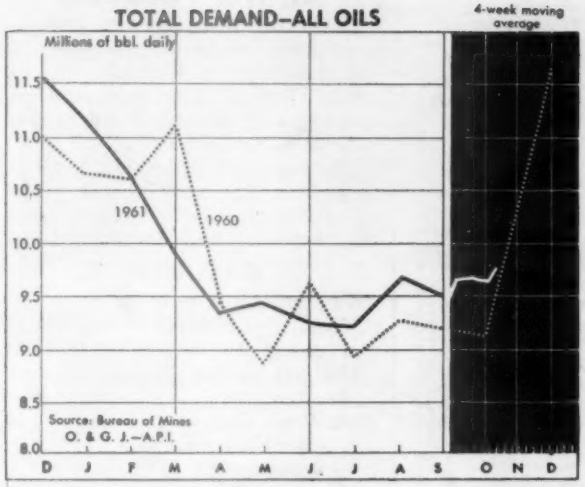
	November 11, 1961 Crude oil	Lease condensate	Total	Nov. 4 total
Alabama	18,750	.....	18,750	17,100
Alaska	23,200	.....	23,200	23,000
Arkansas	75,000	125	75,125	74,175
California	816,000	.....	816,000	816,300
Colorado	126,400	.....	126,400	127,000
Eastern	41,400	.....	41,400	40,200
Florida	1,000	.....	1,000	950
Illinois	220,600	.....	220,600	213,600
Indiana	31,100	.....	31,100	31,100
Kansas	†298,100	.....	†298,100	†309,025
Kentucky	51,700	.....	51,700	51,800
Louisiana	1,045,000	165,750	1,210,750	1,201,050
Michigan	52,500	.....	52,500	52,500
Mississippi	146,000	4,200	150,200	150,200
Montana	87,000	.....	87,000	86,600
Nebraska	71,400	.....	71,400	69,800
Nevada	450	.....	450	400
New Mexico	310,000	9,000	319,000	317,850
North Dakota	55,600	.....	55,600	59,200
Oklahoma	†496,900	.....	†496,900	†491,400
Texas	2,430,000	93,800	2,523,800	2,509,500
Dist. 1	43,000	2,900	45,900	45,900
Dist. 2	106,000	8,000	114,000	112,275
Dist. 3	306,000	38,000	344,000	343,425
Dist. 4	177,000	14,000	191,000	190,425
Dist. 5	26,000	850	26,850	26,850
Dist. 6	117,000	.....	117,000	124,350
East Texas field	128,000	8,500	136,500	126,850
Dist. 7-B	120,000	500	120,500	123,350
Dist. 7-C	107,000	3,550	110,550	109,975
Dist. 8	1,000,000	13,000	1,013,000	1,001,575
Dist. 9	195,000	2,500	197,500	196,950
Dist. 10	105,000	2,000	107,000	107,575
Utah	90,850	.....	90,850	92,500
Wyoming	408,700	.....	408,700	405,200
Others	‡785	.....	‡785	‡650
Total U. S.	6,898,435	272,875	**7,171,310**	7,141,100
Change from previous week, up			**30,210**	
Canada	†567,900	†17,500	†585,400	†580,000

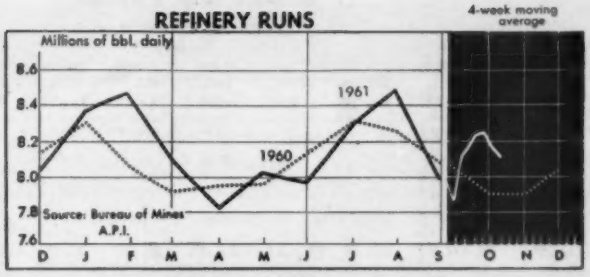
Total U. S. prod.—Jan. 1-Nov. 11 ..... 2,264,866,570 bbl.
Same period last year (crude plus cond.) ..... *2,217,284,300 bbl.

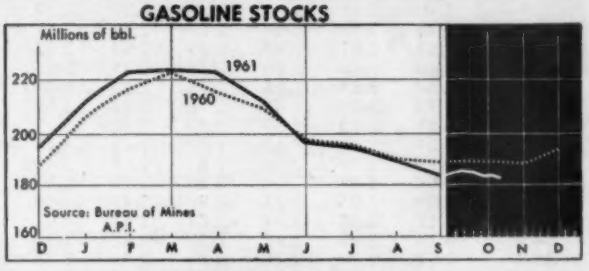
*Includes 71,303,700 bbl. condensate. †Week ended previous Monday. ‡South Dakota, Arizona, and Missouri.

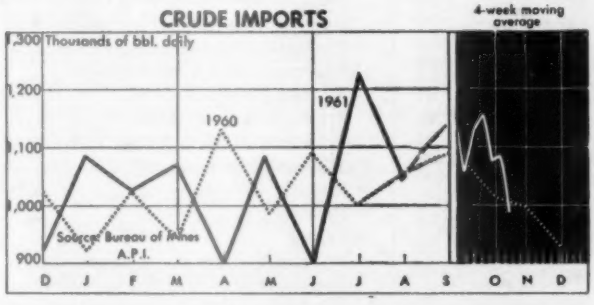
CRUDE-OIL PRODUCTION 4-week moving average

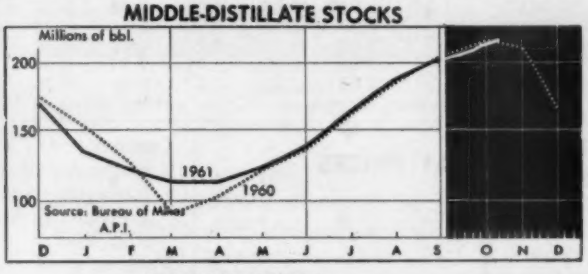


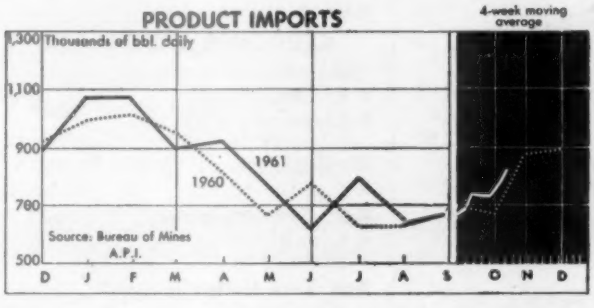


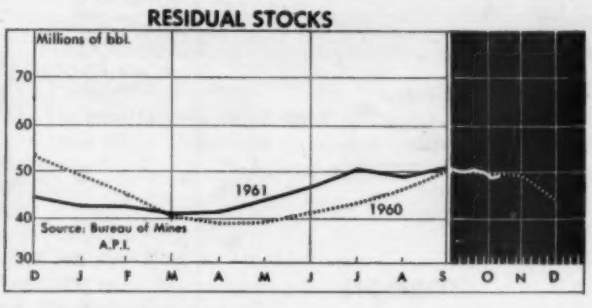












API refinery report—November 10, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1960 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,050	455.1	37.9	336.1	105.0	43,798	15,105	73,362	13,945	1,062	503.8	34.1	332.7	145.4
Appalachian:														
District 1	112	47.4	1.9	24.0	13.9	5,671	764	4,332	436	98	39.9	4.1	19.9	11.8
District 2	59	41.7	3.1	17.0	5.1	3,106	429	1,769	195	102	52.7	7.2	18.7	12.4
Ind., Ill., Ky.	1,551	768.3	86.6	344.4	182.4	30,627	7,656	31,818	5,824	1,429	735.5	80.4	313.5	167.4
Minn., Wis., Dak.	127	64.3	14.3	21.7	16.4	6,450	1,934	8,969	631	115	55.0	5.3	27.1	22.0
Okla., Kans., Mo.	714	402.6	18.3	173.1	16.0	16,309	1,756	13,064	940	706	410.9	11.0	176.5	19.3
Inland Texas	292	209.4	11.6	43.0	19.3	7,144	658	1,372	2,820	274	214.6	9.7	45.3	18.7
Texas Gulf Coast	1,810	946.1	104.1	480.6	127.0	23,471	3,332	16,934	5,413	1,881	968.9	140.1	457.8	135.7
La. Gulf Coast	723	339.7	66.4	170.1	27.4	9,233	1,963	7,329	1,114	645	358.7	73.0	143.5	39.9
N. La. and Ark.	117	68.9	0.1	25.8	3.9	6,011	697	3,278	190	108	68.2	5.8	21.4	7.3
Rocky Mountain:														
New Mexico	28	15.3	0.4	5.0	2.6	725	60	310	97	22	11.7	0.3	3.9	2.7
Other Rocky Mt.	261	123.6	3.1	65.7	30.9	5,015	571	2,380	1,174	280	140.9	3.5	67.7	33.6
West Coast	1,235	514.3	39.9	241.7	286.7	24,724	2,163	14,941	16,744	1,171	527.9	38.9	201.3	287.6
Nov. 10, 1961	8,079	3,996.7	387.7	1,948.4	836.6	182,284	37,088	179,858	49,523	7,893	4,088.7	413.4	1,829.3	903.8
Nov. 3, 1961	7,834	4,016.6	400.0	1,929.1	785.6	§183,931	37,049	179,000	48,702	.....	.....	.....	.....	.....
Nov. 11, 1960	7,717	3,864.4	405.1	1,816.9	770.4	183,062	36,229	179,154	48,724	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines. §Rev.

Prices

CRUDE-OIL PRICES

Gravity schedule

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver-Julesburg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	†$2.35	$2.61	$2.29	$2.95	$2.90	‡$2.38	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.40	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.42	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.44	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.46	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.48	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.50	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.52	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.54	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.56	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.58	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.60	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.62	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.64	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.66	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.68	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.70	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.72	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.74	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.76	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.78	2.95

*Cooke, Grayson, Montague. †Other posting starts at $2.55. ‡Some at 2.58.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.10-3.25
Conroe	3.23-3.53
Van	2.93-3.08
Pennsylvania Grade:	
Bradford	$4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	**3.00**

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34,9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41°-41.9°, Umm said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.63
Redwater (Alta.)	2.52
Weyburn (light)	2.185
Midale C	1.89
Venezuela:	
Cumarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Price for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long ton)

(Latest reported spot fixtures)

Gulf-NY, clean (ATRS Flat)	$2.85
★ Gulf-NY, dirty (ATRS Flat)	2.85
★ Carib.-NY, dirty (ATRS—46.25%)	1.48
★ PG-UK, dirty (Scale—57.5%) (26s. 7d.)	3.72
★ PG-Japan, dirty (USMC—65%)	3.57

★ Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refinenrs' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (91 octane)	10.25-10.50
Premium (99 octane)	13.00-13.25
†Natural gasoline (26-70)	4.5
†Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements): movements):	
Regular (90 octane)	10.50-11.00
Regular (92 octane)	10.75-11.25
Premium (98 octane)	11.75-12.25
California (rack) Los Angeles:	
Regular (90 octane)	11.20
Premium (94 octane)	12.20
Premium (100 octane)	13.35
Caribbean area (cargoes):	
Regular (87 octane)	9.00
Premium (97 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	9.50-10.00
★ Diesel oil (58 d.i. and above)	9.00-9.50
★ Distillate No. 1	9.00-9.50
★ Distillate No. 2	8.25-8.75
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.75
★ Distillate No. 2	8.75
New York Harbor (barges):	
Kerosine 42-43	11.20
Distillate No. 2	10.20
Diesel fuel, 48-52 d.i.	10.35
Caribbean area (cargoes):	
Distillate No. 2	8.10

RESIDUAL FUEL

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.65-1.75
Gulf Coast (cargoes):	
Bunker C fuel	2.20
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C fuel	2.00
California (rack):	
Bunker C fuel, Los Angeles	2.25

†Due to the decline in market for Grade 26-70 natural gasoline, The Oil and Gas Journal will discontinue publication of prices for this grade of natural gasoline at the end of 1961.

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Driller's Handbook No. 1	$1.50
Driller's Handbook No. 2	1.50
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Better Drilling Operations	1.50
Corrosion and its Control	1.25
Well Completions	1.50
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Fundamentals of Electric Logging	1.50
How to Interpret Electric Logs	.50
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Handbook of Modern Secondary Recovery Methods	1.50
Water Flooding-Design and Operation	1.25
Why Was My Well Dry?	.50
Formation Fracturing	1.50
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Heat Transfer Calculations	1.50
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1961 Survey of Gas Processing Plants	2.00

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50,000 FT. 20 inch No. 1 grade used pipe. Lengths 20 ft. square cut ends. Weight 78# to the ft. High Tensile Pipe. Indiana-Ohio Pipe Co., P. O. Box 5462 Shep. Sta., Columbus 19, Ohio. Phone CL 3-5527—CL 3-5528.

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ASPHALT SALES manager available because of impending merger. Over twenty successful years in engineering, marketing and promotion of highway and industrial asphalts. Present employer will discuss my background and capabilities. Please reply in confidence to Box M-645, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, BS, 5 years experience in South Louisiana. Desires position with aggressive independent company. Box M-642, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, 39, prefers overseas assignment. Most recently chief geophysicist of foreign company. Resume on request. Box M-641, The Oil and Gas Journal, Tulsa, Oklahoma.

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LEGAL

U. S. TREASURY DEPARTMENT—Internal Revenue Service. Notice of sealed bid sale, November 7, 1961. Pursuant to authority contained in Section 6331 of the Internal Revenue Code, the following described property has been seized for nonpayment of delinquent internal revenue taxes due from Jesse E. Sr. and Rhoda Hall, 900 So. Lamar, Weatherford, Texas. The property will be sold in accordance with the provisions of Section 6335 of the Internal Revenue Code and the regulations thereunder, at public sale under sealed bids which will be opened on the 6th day of December, 1961, at 4:00 pm., at room 101, U. S. Courts Bldg., 10th and Lamar Streets, Fort Worth Texas. United States Patents as listed: Patent number 2,735,495—Oil well bore scratcher; Patent number 2,671,515—Well bore cleaning scratcher; Patent number 2,717,650—Centralizer for well cementing; Patent number 2,731,816—Process for conditioning cementing; Patent number 2,808,112—Scratchers. The property is offered for sale either as separate items or in the aggregate or both. Only the right, title, and interest of Jesse E. Sr. and Rhoda Hall in and to the property is offered for sale. Prospective bidders are requested to write or call in person at the office of the District Director at Room 101, U. S. Courts Bldg., 10th and Lamar Sts. Fort Worth, Texas for the purpose of securing Internal Revenue Service Form 2222, Sealed Bid For Purchase of Seized Property, and for information concerning inspection of the property. Bids must be submitted directly to F. H. Thompson, Revenue Officer, 101 U. S. Courts Bldg., Fort Worth, Texas prior to the time set for opening the bids. Bids must be accompanied by the full amount of the bid if the total bid is $200 or less. If the total bid is more than $200, 20% of the bid or $200, whichever is greater, must be submitted therewith. The terms of payment of the balance of the purchase price are payment in full in cash or cashier's check upon acceptance of the highest bid. Ellis Campbell, Jr. (District Director of Internal Revenue).

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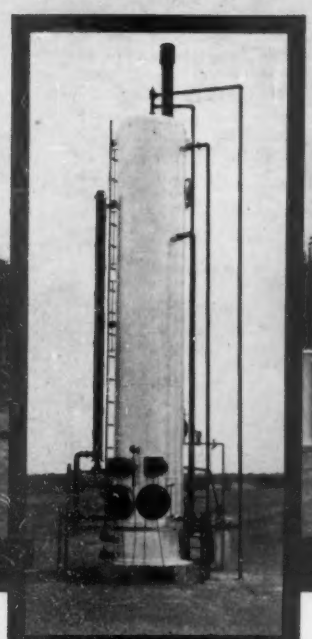

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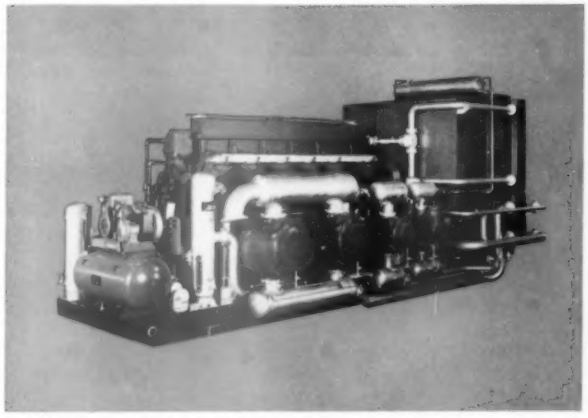
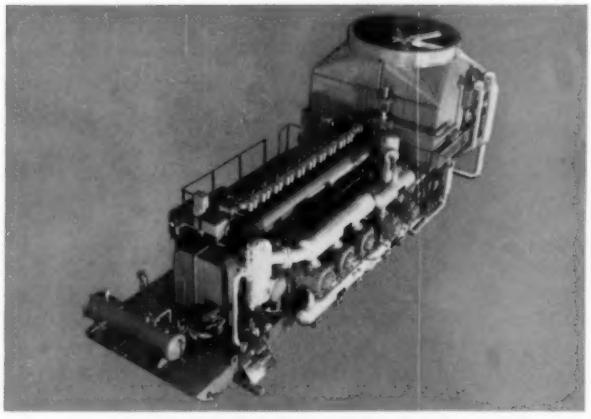


A 660 hp Ingersoll-Rand 12-SVG-3 compressor packaged by Southwest Industries, is in gas injection service in West Texas.

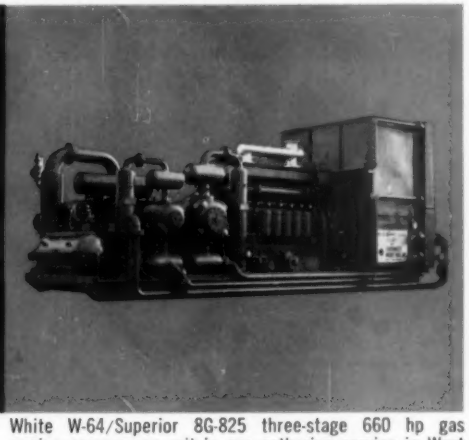


A Clark HMB-10 550 hp compressor packaged by Southwest for a major oil company is in service for gas sales boosting in South Louisiana.

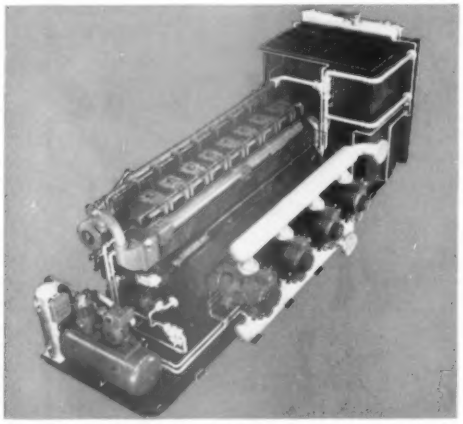
This 660 hp Cooper-Bessemer GMXD-10 compressor has been packaged by Southwest for gas gathering service on an offshore platform in South Louisiana.

SOUTHWEST INDUSTRIES, INC.

P. O. Box 19188, Houston 24, Texas



White W-64/Superior 8G-825 three-stage 660 hp gas engine compressor unit in gas gathering service in West Texas.



This 750 hp Worthington SLHC-8 compressor in a Southwest Packaged Plant is being used by a major gas transmission company for pipeline boosting in East Texas.

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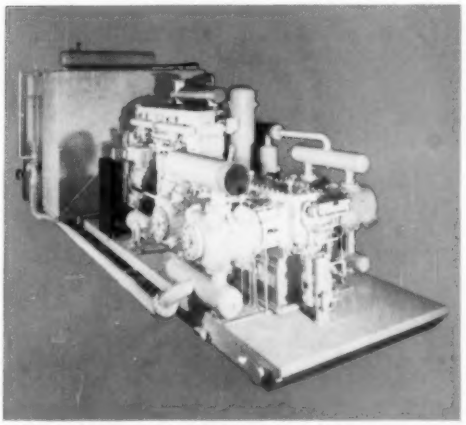

White W-64/Superior 8G-825 two-stage 660 hp gas engine compressor unit in gas gathering service in Southeast Texas.

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